



2018–2019 Washington Wattsmart Business Program Evaluation

FINAL REPORT

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Glossary of Terms

Custom Energy Savings Calculation Methodology

Energy savings calculated using a custom methodology require project and site-specific inputs, such as operating hours, average load, and equipment performance. These projects typically do not meet requirements for deemed or prescriptive calculations (described below), and are commonly industrial/process-related. Metered and/or trend data are typically collected during the analysis and/or post-inspection phase of custom projects.

Deemed Energy Savings Calculation Methodology

Energy savings calculated using deemed values refer to one savings factor-per-measure unit for all projects, regardless of facility types, equipment end uses, or operating hours. For example, Pacific Power uses a deemed value of 1,160 kWh/horsepower for all HVAC variable frequency drive.

Demand Side Management Central

Demand Side Management Central (DSMC) is Pacific Power's project management and reporting database, which provides project management tools, validation check on each project, and a data warehouse with reporting capability.

Evaluated Savings

Evaluated savings represent the total program savings, based on the validated savings and installations, without an adjustment for behavioral effects such as freeridership or spillover. They are most often calculated for a given measure 'i' as:

$$\text{Evaluated Savings}_i = \text{Verified Installations}_i * \text{Unit Consumption}_i$$

Freeridership

Freeridership in energy efficiency programs is represented by participants who would have adopted the energy-efficient measure in the program's absence. This is often expressed as the freeridership rate, or the proportion of evaluated savings that can be classified as freeridership.

Realization Rate

The realization rate is the ratio of evaluated savings to the savings reported (or claimed) by the program.

In-Service Rate

The in-service rate (also known as the installation rate) is the proportion of measures that received incentives that were actually installed.

Prescriptive Energy Savings Calculation Methodology

Energy savings calculated using a prescriptive methodology or calculator require more than one input to determine energy savings (e.g., HVAC equipment performance, operating hours, and capacity).

T-Test

In regression analysis, a t-test is applied to determine whether the estimated coefficient differs significantly from zero. A t-test with a p-value less than 0.10 indicates that there is a 90% probability that the estimated coefficient is different from zero.

Technical Resource Library

The Technical Resource Library is the official database repository of measure assumptions, which is linked to Pacific Power's DSMC project database.

Trade Ally

For the purposes of the process evaluation, trade allies include any market actors who provide design services, as well as contractors, distributors, manufacturers, and vendors who provide facility evaluations and/or supply or install energy-efficient measures that received incentives through the program.

Executive Summary

Through its Wattsmart Business program, Pacific Power offers services and incentives to help commercial, industrial, and agricultural/irrigation customers maximize the energy efficiency of their equipment and operations through midstream (distributors/suppliers) and downstream (customer) incentive mechanisms. Incentives are available for retrofit projects and new construction and major renovation projects. During the 2018 and 2019 program years, the Wattsmart Business program reported electricity savings of 52,013,462 kWh.

Pacific Power offers program measures and services to customers through four delivery channels: Trade Allies (promoting Typical Upgrades), Small Business Enhanced Incentive, Midstream/Lighting Instant Incentive Offer, and Project Managers (promoting Custom incentives). Pacific Power contracts with Cascade Energy and Nexant to manage the day-to-day operations of the Trade Ally, Small Business Enhanced Incentive, and Midstream/Lighting Instant Incentive delivery channels, where program offerings are primarily marketed and delivered to customers through local trade allies. Through the Project Manager delivery channel, Pacific Power's Energy Efficiency Project Manager and program administrators, deliver technical energy analysis services and custom incentives to large managed account customers (typically larger than 1 MW) engaged in more complex projects not covered under one of the other offerings.

Pacific Power contracted with the Cadmus team (comprising Cadmus and VuPoint Research) to conduct impact and process evaluations of the Washington Wattsmart Business program for the 2018 and 2019 program years. For the impact evaluation, the team assessed energy impacts and program cost-effectiveness. For the process evaluation, the team assessed program delivery and efficacy, bottlenecks, barriers, and opportunities for improvements. VuPoint Research performed the process evaluation telephone surveys.

At Pacific Power's request, the Cadmus team evaluated program participants and reported the 2018-2019 evaluation findings under the following categories:

- **Wattsmart Business (Typical Upgrades and Custom Analysis).** This category is for projects delivered through the Trade Ally and Project Manager delivery channels. Pacific Power offers customers prescriptive incentives (Typical Upgrades) for measures including irrigation, HVAC, lighting, motors, building shell, food service equipment, and refrigeration along with energy analysis studies. It also offers custom incentives (Custom Analysis) for verified first-year energy savings resulting from the installation of qualifying capital equipment upgrades and energy management measures not covered by the Typical Upgrades incentives or any other Wattsmart Business program delivery offering.
- **Small Business Enhanced Incentive.** Pacific Power provides free facility assessments and enhanced incentives for small business customers who installed qualifying LED lighting and lighting controls upgrades. A network of program-approved contractors perform the assessments and installed lighting upgrades for this offer.

- **Midstream/Lighting Instant Incentive.** Pacific Power offers instant point-of-purchase incentives for qualifying LED and reduced wattage fluorescent lamps and retrofit kits purchased from a participating lighting distributor. Customers (including those purchasing from nonparticipating suppliers) can apply for incentives after making the purchase.

Key Findings

Key Impact Evaluation Findings

In general, Cadmus deferred to current Regional Technical Forum (RTF) measure workbooks and saving estimation methodologies, where available. The RTF uses a market baseline to calculate evaluated measure-level savings—a baseline more efficient than federal or state minimum code requirements.

This market baseline provides a snapshot in time and represents values such as the average efficiency. In many instances, reported savings were based on as-found conditions. For both baselines (market and as-found), Cadmus reviewed the baseline—and, if available, the methodology used to derive the baseline—for reasonableness.

For the impact evaluation, the Cadmus team analyzed 93 projects that contributed 29.8% of the 2018 and 2019 program savings. Table 1 provides a summary of the evaluation findings, including the number of unique projects, evaluated savings, and achieved precision. Overall, the realization rate was 98.9% for the two program years, though variability occurred between measure categories. The impact evaluation achieved $\pm 1.0\%$ precision with 90% confidence overall. The report's *Evaluated Savings Results by* section describes specific details and findings per strata. Two strata, Lighting and Refrigeration, account for over 76% of the savings in Washington.

The key findings for those strata are described in the following bullet points:

- Lighting accounts for 53% of all reported energy savings in Washington. Cadmus evaluated 26 projects accounting for nearly 5% of reported energy savings within the lighting strata, resulting in a realization rate of just under 99% within that strata. The differences in savings primarily resulted from discrepancies in the reported hours of use (mainly from midstream lighting projects).
- Refrigeration projects make up the second highest strata, with 23% of all reported energy savings. Cadmus evaluated 17 of the refrigeration projects accounting for 45% of reported energy savings within the refrigeration strata, and the realization rate was just over 99% within the strata. The team found most projects achieved savings very close to 100%, with minor deviations due to changes in setpoints or equipment load profiles.

Table 1. 2018 and 2019 Washington Wattsmart Business Program Savings

Strata	Unique Projects ^a	Reported Savings (kWh)	Evaluated Savings (kWh)	Realization Rate	Precision ^b
Lighting	616	27,440,002	27,135,074	98.9%	1.3%
Refrigeration	59	12,140,083	12,024,926	99.1%	1.7%
Energy Management	19	5,809,304	5,805,397	99.9%	0.1%
Compressed Air	17	2,505,457	2,374,975	94.8%	2.0%
Other	40	1,711,630	1,718,461	100.4%	1.4%
Irrigation	49	1,515,277	1,360,382	89.8%	4.4%
HVAC	46	891,709	1,009,800	113.2%	15.9%
Total	846	52,013,462	51,429,015	98.9%	1.0%

^a A unique project is defined as each unique project ID per stratum. In some cases, a project may involve measures implemented in multiple strata; these would be counted as multiple unique projects.

^b Poor precision values are the result of large variability within sampled projects.

Table 2 and Table 3 show impact evaluation findings by program year, for 2018 and 2019, respectively. The Cadmus team combined the 2018 and 2019 program years to perform the analysis and applied the overall realization rates to the reported savings for each year.

Table 2. 2018 Washington Wattsmart Business Program Savings^a

Strata	Unique Projects	Reported Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
Lighting	347	16,520,907	16,337,318	98.9%
Refrigeration	35	8,918,159	8,833,564	99.1%
Energy Management	10	2,539,217	2,537,509	99.9%
Compressed Air	6	1,353,235	1,282,760	94.8%
Other	24	1,134,513	1,139,041	100.4%
Irrigation	17	417,195	374,548	89.8%
HVAC	9	343,286	388,748	113.2%
Total	442	31,226,512	30,893,488	98.9%

^a Totals may not sum due to rounding.

Table 3. 2019 Washington Wattsmart Business Program Savings^a

Strata	Unique Projects	Reported Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
Lighting	269	10,919,095	10,797,756	98.9%
Energy Management	9	3,270,087	3,191,362	99.1%
Refrigeration	24	3,221,924	3,267,888	99.9%
Compressed Air	11	1,152,222	1,092,215	94.8%
Irrigation	32	1,098,082	579,420	100.4%
Other	16	577,117	985,833	89.8%
HVAC	37	548,423	621,052	113.2%
Total	394	20,786,950	20,535,526	98.8%

^a Totals may not sum due to rounding.

Key Process Evaluation Findings

The key process evaluation findings follow. This report's *Process Evaluation* section provides more nuanced descriptions of these key findings.

Trade Ally Experience

- Six of seven trade allies said the program fits well with their business model or was an integral part of their system. The one trade ally who said the program does not fit well with their sales model indicated that they are still trying to grow their business in Washington, so it may fit well in the future.
- Four of seven trade allies were familiar with the postcard campaign and two cited specific aspects such as the shirts which were provided, as being especially helpful with customer interactions due to the increased legitimacy they provided.
- All trade allies indicated they were satisfied with the program. One trade ally did note worries about moving more of the program process online and its effect on the on-site process with customers. One other trade ally mentioned having issues with making updates to forms for projects due to them changing in between updates.
- Two trade allies mentioned that the usage threshold for eligibility as a small business leaves out some convenience stores and minimarts which would typically be considered small, however, because of unusual business hours, their power usage may make them ineligible for small business incentives.

Participant Experience

Typical Upgrades and Custom Analysis

- The Pacific Power website was identified as the primary information source of the Typical Upgrade and Custom Analysis incentives among respondents (27%, n=22).
- Fourteen of 18 respondents said their projects were primarily installed by an independent contractor rather than by themselves (two respondents) or a Wattsmart Business program participating trade ally (two respondents).
- Satisfaction was high for the program overall and for certain program components such as the measure that was installed, work provided by a trade ally, and the incentive amount. Respondents were still likely to be satisfied with the time it took to receive their rebate and the ease of filling out their paperwork, but a few were less than satisfied.
- Twenty-two of 24 participants reported one or more benefits:
 - 52% reported saving money on their utility bills; lower energy bills
 - 43% reported using less energy, reducing energy consumption or energy demand
 - 39% reported better aesthetics/better or brighter lighting
 - 35% reported improved equipment function
 - 30% reported savings money on maintenance costs

Small Business Enhanced Incentives

- Four of six respondents reported learning about the program through their electrician or contractor.
- Three of six respondents cited reducing their energy usage and greenhouse gas footprint as the most significant factor in their decision to participate in the program.
- One respondent said they wanted to install other lighting equipment that was not offered in their project proposal. This respondent specified they wanted to install lighting covers as part of their project.
- Small Business Enhanced Incentives participant satisfaction levels were high among program components and the program overall.
- Half of the respondents identified more than one benefit from participating in the Small Business Enhanced Incentives offering (n=6). The two most identified benefits were “Better aesthetics/better or brighter lighting” and “Saving money, reducing energy consumption or demand” (n=6).

Lighting Instant Incentives:

- Respondents reported high levels of satisfaction with the program overall and each of the components that were asked about (n=2).
- Neither respondent reported encountering any challenges participating in the program.

Partial Participants

- Both partial participants reported not completing projects due to time constraints when initially working on their projects. One of the respondents said they were *very likely* to request an incentive for a project in the next six months and one said they were *somewhat likely*.

Nonparticipants

- Over half the nonparticipants were not aware of the Wattsmart Business program (60%, n=197); of those who were aware, 65% were *not too likely* or *not likely at all* to participate in the next six months (n=77).
- Nonparticipants said energy efficiency was not worth the required upfront investment. Over half *somewhat agreed* or *strongly agreed* with the statements that their company has made all the energy efficiency improvement they can without substantial investment (68%, n=170) and making energy efficiency upgrades to their facility is too costly (63%, n=149).

Cost-Effectiveness Results

As shown in Table 4, the program proved cost-effective in the 2018 and 2019 evaluation years from the PacifiCorp Total Resource Cost (PTRC) test, with a benefit/cost (B/C) ratio of 1.32. It was also cost-effective according to the Total Resource Cost (TRC) test, Utility Cost Test (UCT) and Participant Cost Test (PCT) perspectives. The program was not cost-effective from the Ratepayer Impact Measure (RIM) test perspective.

Table 4. 2018–2019 Evaluated Wattsmart Business Program Cost-Effectiveness Summary^a

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PacifiCorp Total Resource Cost Test (PTRC) (TRC + 10% Conservation Adder)	\$0.0359	\$16,946,776	\$22,385,981	\$5,439,205	1.32
Total Resource Cost Test (TRC) No Adder	\$0.0359	\$16,946,776	\$20,350,892	\$3,404,116	1.20
Utility Cost Test (UCT)	\$0.0223	\$10,536,070	\$20,350,892	\$9,814,822	1.93
Ratepayer Impact Measure (RIM) Test		\$50,212,489	\$20,350,892	(\$29,861,597)	0.41
Participant Cost Test (PCT)		\$11,659,219	\$44,924,933	\$33,265,714	3.85
Lifecycle Revenue Impacts (\$/kWh)					\$0.000728761
Discounted Participant Payback (years)					1.54

^aThe cost-effectiveness calculations assume a net to gross of 1.0 in Washington.

Recommendations

Based on the impact and process evaluation interviews, surveys, site visits, measurements, and other analyses, the Cadmus team drew the following recommendations (this report's *Conclusions and Recommendations* section provides a more complete discussion of the findings and associated recommendations).

Savings Considerations

Recommendation: Cadmus recommends Pacific Power adopt the deemed savings values by bulb type and lumen output from the RTF's Non-Residential Lighting Midstream.

Participant Experience

Recommendation: Continue to monitor the program administrative systems for potential improvements, such as the ongoing effort to develop an online application portal for participants. Online applications are a best practice for nonresidential incentive programs because they reduce the perceived paperwork burden for participants by auto-populating some fields, keep all project documents in a single location, and allow customers to reference the status of their application as it is being processed.

Recommendation: Leverage the successes of companies that have been able to grow their sales volume or expand their sales territory using the program in order to encourage more of the 40 registered trade allies to actively participate in the program. If not already available, Nexant should develop case studies of specific installers active in the small business program who can demonstrate measurable benefits as a result of their participation. In addition, Nexant should continue to develop and grow the lead generation campaign in order to increase participation in the Small Business Enhanced Incentive program further. If possible, Nexant should establish criteria for installers to be eligible for this initiative, and promote it as a potential benefit for engaged participating installers.

Nonparticipants

Recommendation: Nexant should continue to focus on ways to expand the Small Business Enhanced Incentive offering, since this offering is designed to target small businesses. Increasing activity among trade allies, as suggested above, should also drive increased participation by small businesses as well as customers overall. In addition, small businesses often experience greater technical, financial, and administrative burdens than larger businesses.

If it is not doing so already, Pacific Power should collect data from its financing partner, National Energy Improvement Fund, on applications received and applications funded. Ideally, this information could be incorporated into the DSMC database. If small businesses are not using this resource as often as larger firms do, additional outreach may be helpful to let small businesses know the resource is available. If small businesses are not being approved as often as large businesses are, Pacific Power may want to consider alternative financing support.

Introduction

Pacific Power offered several Wattsmart Business technical assistance and incentive options in the 2018-2019 cycle:

- Typical Upgrades incentive
- Custom Analysis incentive
- Small Business Enhanced Lighting incentive
- Lighting Instant incentive
- Energy Management

Typical Upgrades Incentive. Through this offering, Pacific Power provides prescriptive incentives primarily for small and midsize customers, although large customers may also receive these incentives. These incentives are available to customers who submit an application directly or work with a Pacific Power trade ally.

Custom Analysis Incentive. For large energy users or customers with projects that require custom analysis, Pacific Power targets incentives that generally offer multiple opportunities for energy efficiency upgrades. Midsize and smaller customers may also participate in Custom Analysis incentives.

Pacific Power's program administrators work with account managers, with trade allies, and directly with interested customers to help identify energy efficiency opportunities and provide analysis and verification of custom savings. The incentive is based on the expected project savings with caps applied for project costs and one-year payback.

Small Business Enhanced Incentive. This offering is delivered through the trade ally network to provide enhanced lighting incentives for small business customers.

Lighting Instant Incentive. Through this offering, Pacific Power targets the lighting maintenance market by offering customers instant point-of-purchase incentives on qualified LEDs, occupancy sensors, and retrofit kits purchased through a participating lighting distributor. Customers purchasing through a nonparticipating distributor do not receive an instant discount, but they may apply to Pacific Power for incentives after the purchase.

Energy Management. Through this offering (e.g., recommissioning, industrial recommissioning, persistent commissioning), participating customers may receive expertise and custom incentives for verified savings achieved through improved operations, maintenance, and management practices.¹

Pacific Power contracted with Cascade Energy and Nexant to administer these offerings. The administrators manage components of marketing and outreach; trade ally recruitment, training, and

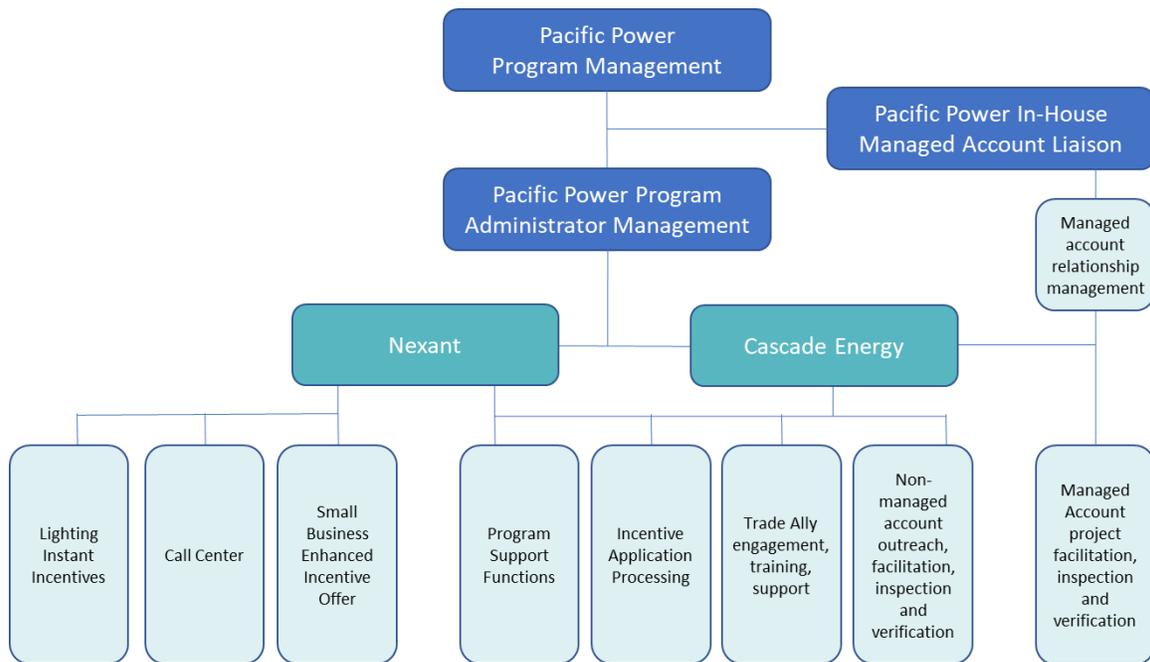
¹ Cadmus evaluated four industrial recommissioning projects (typically categorized as Energy Management) under the Wattsmart Business category for the 2016–2017 evaluation period.

support; technical services for customers; and application processing services. Nexant manages offerings for most commercial measures. Cascade Energy manages offerings for agricultural and industrial measures.

Across all sectors, outreach to managed accounts (customers with average demand around 1 MW or higher) are initiated and coordinated through the Pacific Power in-house managed account project manager. Once the managed account customer has indicated interest, Cascade Energy manages the project through to completion.

Figure 1 provides an overview of the program management responsibilities.

Figure 1. Wattsmart Business Program Delivery Roles



Evaluation Objectives

The Cadmus team assessed the Wattsmart Business program incentives to determine savings and cost-effectiveness and, where applicable, identified areas to improve program delivery and customer involvement and satisfaction. Table 5 lists the evaluation goals along with the corresponding evaluation activities employed to achieve those goals.

Table 5. Evaluation Objectives and Activities

Pacific Power Evaluation Objectives	Management Interviews	Participant Surveys	Partial Participant and Nonparticipant Surveys	Trade Ally Interviews	Virtual Site Assessments	Engineering Analyses	Site-Level Billing Analysis	Reporting
Document and measure program effects	✓	✓	✓	✓	✓	✓	✓	✓
Verify installation and savings		✓			✓	✓	✓	
Evaluate the program process and the effectiveness of delivery and efficiency	✓	✓	✓	✓				
Understand motivations of participants, nonparticipants, and partial participants		✓	✓					
Provide data support for program cost-effectiveness assessments		✓			✓	✓	✓	
Identify areas for potential improvements	✓	✓	✓	✓	✓	✓	✓	
Document compliance with regulatory requirements								✓

Data Collection and Evaluation Activities

The Cadmus team performed virtual assessment (due to COVID-19) and engineering analysis for 93 projects to achieve at least 90% confidence and $\pm 10\%$ precision at the portfolio level. The process evaluation focused on assessing changes to program design since the 2016-2017 cycle and on monitoring trade ally and participant response to program design and delivery. Primary data collection included interviews with program managers, administrators, and trade allies and surveys with participant and nonparticipant customers.²

Impact Sampling and Extrapolation Methodology

Through the Washington Wattsmart Business program, Pacific Power provides incentives for the 27 measure types shown in Table 6. The Cadmus team stratified these 27 measure types into the seven strata shown in the table and designed the strata to account for the largest amount of savings and quantity of projects per stratum.

The team designed the sampling plan for 2018 and 2019 combined participation to achieve approximately $\pm 20\%$ precision at 80% confidence per stratum and to exceed $\pm 10\%$ precision at 90% confidence at the nonresidential portfolio level. To account for the wide range of project sizes, the team

² Participants are customers completing a project through the program during the 2018 and/or 2019 evaluation period. Partial participants are customers initiating a project through the program in 2018 or 2019 but who did not complete that project. Nonparticipants are customers who have never initiated or completed a project through the program (or at least not in 2018 or 2019).

created a plan to divide each end-use strata into a selected group, from which it hand-selected a few very large sites, and then randomly sampled the remaining projects.

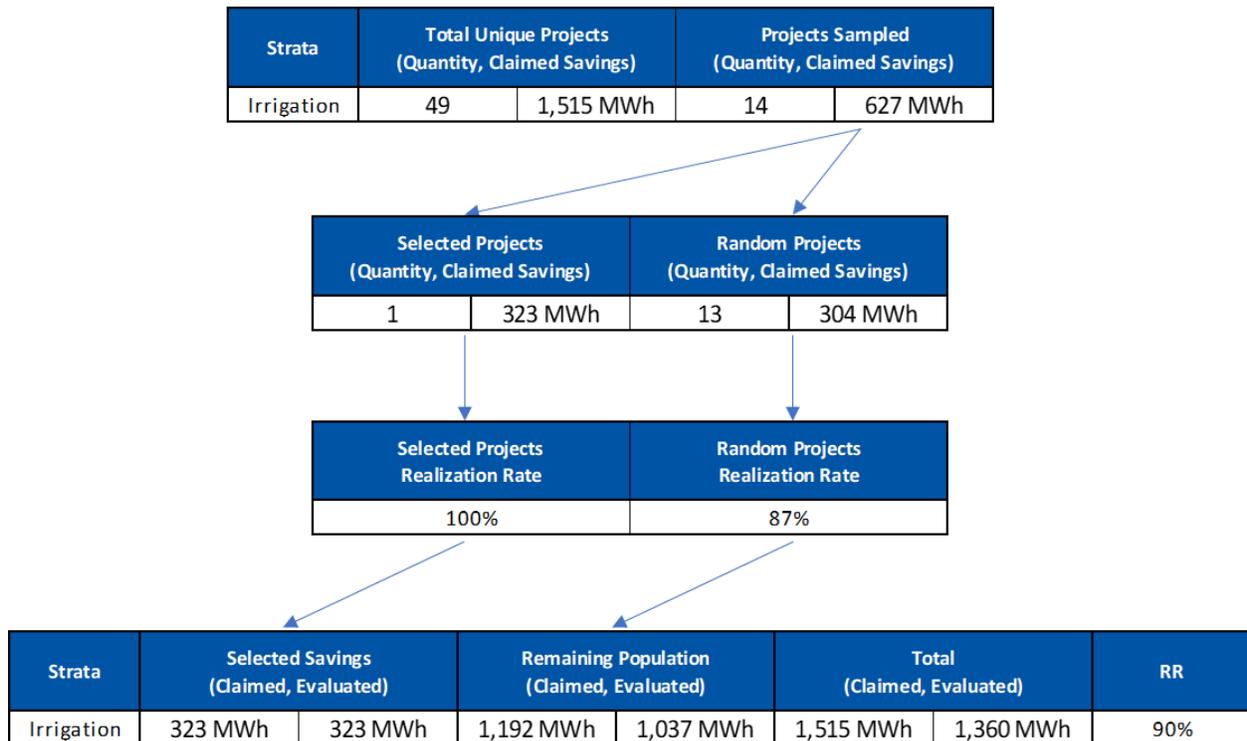
Table 6 shows the total measures and energy savings reported in the tracking database, total reported energy savings, and sampled projects.

Table 6. Washington 2018-2019 Wattsmart Business Program Impact Sampling

Strata	Measure Type	Number of Incentivized Measures	Energy Savings (kWh)	Unique Sampled Projects
Irrigation	Irrigation Pumps	20	1,515,277	14
	Water Distribution Equipment	54		
	Custom	9		
Compressed Air	Custom	14	2,505,457	9
	Compressed Air	8		
Energy Management	Custom	30	5,809,304	11
HVAC	Cooling	17	891,709	7
	Custom	28		
	Controls and Thermostats	3		
	Heat Pump	9		
	Motors	5		
Lighting	General Illuminance	1,253	27,440,002	26
	Controls	76		
	Non-General Illuminance	45		
	Lighting	356		
	Exterior Lighting	28		
Other	Custom	12	1,711,630	9
	Windows	3		
	Insulation	7		
	Green Motor Rewinds	9		
	Roof	9		
	Dishwashers	4		
	Refrigeration	2		
	Vacuum Pump	2		
Refrigeration	Custom	66	12,140,083	17
	Controls	2		
	Fast Acting Door	42		
Total		2,113	52,013,462	93

The Cadmus team divided sampled projects into two categories: selected and random. Random projects were chosen randomly, and the evaluated results were extrapolated to the rest of the population in the stratum. Selected projects were hand-picked from the projects with the highest claimed energy savings per stratum. The team evaluated these projects individually and included the results in each stratum, but it did not extrapolate the associated realization rates to the population. Figure 2 provides an example of the Cadmus team’s application of realization rates for selected and random sites in the lighting stratum to the population, per stratum.

Figure 2. Realization Rate Extrapolation



RR = realization rate

Table 7 shows the total quantity of projects sampled, the associated reported energy savings, and the percentage this sample represented out of the population.

Table 7. Washington 2018–2019 Wattsmart Business Program Impact Sampling Summary

Strata	Sample Type	Unique Projects Sampled	Reported Energy Savings (kWh)		Percentage kWh Sampled
			Sampled Projects	All Projects	
Lighting	Selected	0	0	27,135,074	4.8%
	Random	26	1,305,724		
Refrigeration	Selected	2	2,801,726	12,140,083	44.8%
	Random	15	2,632,338		
Energy Management	Selected	4	2,756,971	5,809,304	85.0%
	Random	7	2,183,710		
Compressed Air	Selected	5	1,670,943	2,505,457	81.3%
	Random	4	365,000		
Other	Selected	4	380,695	1,711,630	36.6%
	Random	5	245,559		
Irrigation	Selected	1	323,154	1,515,277	41.4%
	Random	13	303,660		
HVAC	Selected	3	393,361	891,709	60.9%
	Random	4	149,372		
Total		93		52,013,462	29.8%

Process Sample Design and Data Collection Methods

Primary data collection in 2018-2019 included in-depth interviews and phone and online surveys. Table 8 presents sampling details for interviews with Pacific Power staff, program administrator staff and participating trade allies.

Table 8. Interviews Conducted for the 2018-2019 Process Evaluation

Interview Group	Target Completes	Total Completes
Pacific Power Staff	1	1
Program Administrators	2	2
Trade Allies	9	7

The team developed survey samples for participants, partial participants, and nonparticipants using simple random sampling from the program tracking data. After removing measures with duplicate or missing contact information, the team stratified the participant sample based on the program offering and further stratified the Typical Upgrades and Custom Analysis participants by the measures they installed. Partial participants and nonparticipants were defined by their actions during the 2018-2019 period, regardless of whether they had completed an incented project before 2018 or in 2020.

Table 9 shows the final sample disposition for survey activities. Participant surveys were delivered online, and the partial and nonparticipant surveys were delivered by phone. The *Surveys* section of the *Process Evaluation* chapter provides a detailed methodology for each surveyed population.

Table 9. Washington 2018-2019 Wattsmart Business Program Survey Sampling

Data Collection Activity	Project Population	Sampling Frame ^a	Target Completes	Achieved Completes
Typical Upgrades and Custom Analysis Participants				
Agricultural	49	23	52	8
Lighting (other than Small Business Enhanced Incentive or Lighting Instant Incentives)	349	75		12
Refrigeration	59	13		4
Other	122	38		0
Small Business Enhanced Participants	110	47	Census	6
Lighting Instant Incentives (Midstream) Participants	157	33	Census	2
Participant Subtotal	846	229	52	32
Partial Participants	70	19	Census	2
Nonparticipants	7,331	6,555	200	200
Total	8,247	6,803	252	234

^a Sampling frame based on unique customers with contact information after removing duplicates.

^b Other includes compressed air, energy management, and HVAC.

Impact Evaluation

This chapter provides the impact evaluation findings for the Wattsmart Business program that resulted from the Cadmus team’s data analysis. The team incorporated the following activities:

- Site-level billing analysis
- Virtual assessments
- Engineering analysis

Reported savings are electricity savings (kWh) that Pacific Power reported in the 2018 and 2019 *Washington Annual Reports on Conservation Acquisition* (annual reports).³ To determine evaluated savings, the Cadmus team applied step 1 through step 4 shown in Table 10 and described in more detail below.

Table 10. Impact Steps to Determine Evaluated Savings

Savings Estimate	Step	Action
Evaluated Savings	1	Tracking Database Review: Validate the accuracy of data in the participant database and assess whether savings match annual reports
	2	Verification: Adjust savings based on actual installation rates
	3	Unit Energy Savings: Validate saving calculations (i.e., engineering review, analysis, and meter data)
	4	Realization Rates: Extrapolate realization rates to the population

Step 1: In the first step of verifying the accuracy of data in the participant database, Cadmus reviewed the program tracking database to ensure that participants and reported savings matched annual reports.

Step 2: Next, the team selected a sample of sites from the Pacific Power program database, stratifying the distribution of measures among sampled sites, primarily by end-use type: lighting, refrigeration, energy management, compressed air, other, irrigation, and HVAC. The team evaluated 93 sampled projects as part of the 2018 and 2019 program evaluation.

Step 3: The team reviewed all project documentation; developed an evaluation, measurement, and verification plan; and in a few instances performed virtual site visits to verify the installation, specifications, and operations of incented measures. The team also collected trend data for nine projects to document historical performance.

³ These reports are available online:

http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Demand_Side_Management/2018/2019_WA_Annual_Report.pdf

http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Demand_Side_Management/2019/WA_AnnualReport_FINAL-Report-CORRECTED_050815.pdf

Step 4: This step involved reviewing measure savings assumptions, equations, and inputs, which included billing analysis for selected measures. For complicated or custom measures, the team conducted an engineering analysis using the appropriate measurement and verification options in the International Performance Measurement and Verification Protocol.⁴ The team used interviews and other operational data to determine hours of use or power consumption for metered equipment types. In some instances, customers provided trend data from their building management systems, which the team used to determine equipment load profiles, hours of use, and performance characteristics.

Project Review

Cadmus reviewed all project documentation available from Pacific Power, which included project applications, equipment invoices, pre-installation reports published by energy engineering consultants, and savings calculation spreadsheets.

The team performed the following tasks for each site:

- Verified the installation and operation of equipment receiving incentives, confirmed that installed equipment met program eligibility requirements, and verified that the quantity of installed measures matched program documentation.
- Collected additional data to inform the savings analyses and performed a detailed review of site project files to collect additional data for each site.
- Where applicable, the team interviewed facility personnel, gathering information such as equipment types replaced and hours of operation.

Engineering Analysis

In general, Cadmus referenced current measure workbooks and saving estimation methodologies from the Idaho Power Technical Reference Manual (TRM) and the RTF.^{5,6} The Idaho Power TRM was updated in 2018 and relies on sources such as the Northwest Power and Conservation Council (NWPPCC), Northwest Energy Efficiency Alliance (NEEA), the Database for Energy Efficiency Resources (DEER), the Energy Trust of Oregon, the Bonneville Power Administration (BPA), third-party consultants, and other regional utilities.

The RTF uses a market baseline to calculate evaluated measure-level savings for midstream lighting projects. This market baseline is more efficient than federal or state minimum code requirements by

⁴ Efficiency Valuation Organization. January 2012. *International Performance Measurement and Verification Protocol, Concepts and Options for Determining Energy and Water Savings, Volume 1*. Page 25. (EVO 10000 – 1:2012). <http://www.evo-world.org/>

⁵ ADM Associates. October 15, 2018. *Technical Reference Manual 2.2*. Prepared for Idaho Power Company. <https://docs.idahopower.com/pdfs/EnergyEfficiency/Reports/2018TRM.pdf>

⁶ Regional Technical Forum. “UES Measures.” Accessed January 2021. <https://rtf.nwcouncil.org/measures>

providing a snapshot in time and representing values such as the average efficiency. In many instances, Pacific Power’s reported savings were based on as-found conditions.

Cadmus reviewed both the market and as-found baselines—and, if available, the methodology used to derive the baseline—for reasonableness.

Overall Evaluated Savings Results

Table 11 lists reported and evaluated savings for the 2018 and 2019 program years, with an overall realization rate of 98.9%.

Table 11. Reported and Evaluated Savings by Program Year

Program Year	Program Savings (kWh)		Program Realization Rate
	Reported	Evaluated	
2018	31,226,512	30,893,488	98.9%
2019	20,786,950	20,535,526	98.8%
Total	52,013,462	51,429,015	98.9%

Table 12 provides the evaluation results for reported and evaluated savings, along with realization rates by measure type.

Table 12. Reported and Evaluated Wattsmart Business Program Savings by Strata (2018-2019)

Strata	Program Savings (kWh)		Realization Rate	Precision ^a
	Reported	Evaluated		
Lighting	27,440,002	27,135,074	98.9%	1.3%
Refrigeration	12,140,083	12,024,926	99.1%	1.7%
Energy Management	5,809,304	5,805,397	99.9%	0.1%
Compressed air	2,505,457	2,374,975	94.8%	2.0%
Other	1,711,630	1,718,461	100.4%	1.4%
Irrigation	1,515,277	1,360,382	89.8%	4.4%
HVAC	891,709	1,009,800	113.2%	15.9%
Total	52,013,462	51,429,015	98.9%	1.0%

^a Precision is calculated at 80% confidence per stratum and 90% confidence for the program overall.

Evaluated Savings Results by Stratum

Lighting

Pacific Power provides incentives for five types of lighting projects: controls, exterior lighting, general illuminance, lighting, and non-general illuminance. These projects are either for retrofits, major renovations, or new construction, and involve high-efficient lighting technologies such as LEDs and or T8s.

Pacific Power provided incentives for 1,758 lighting measures in 616 unique projects and reported 27,440,002 kWh in energy savings for the 2018 and 2019 years. Lighting projects that received incentives accounted for 52.8% of all reported energy savings in Washington.

Methodology

The Cadmus team evaluated 26 lighting projects, accounting for 4.8% of all reported energy savings in the lighting stratum. Pacific Power used the prescriptive Wattsmart Business lighting calculator to determine incentive amounts for all of the lighting projects in Washington. The lighting calculator documents customer information, project locations, light-fixture specifications, energy-saving calculations, and financial information. Critical inputs used to calculate energy savings included the following:

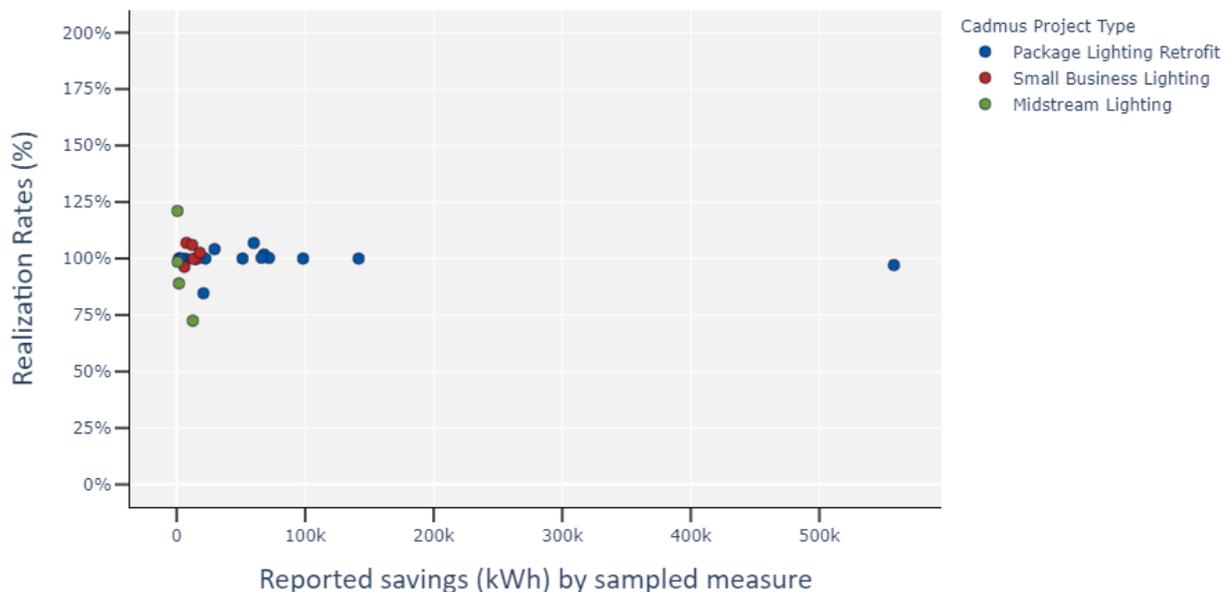
- Lighting operation schedule
- Space name, type, and area
- Baseline lighting fixture location, type, quantity, controls, and wattage
- Proposed lighting fixture location, type, quantity, controls, and wattage

The Cadmus team reviewed the calculator methodology and assumptions to determine their applicability for each sampled project. Historically, hours of use were found to be the driving factor for deviations in realized energy savings, but this year, COVID-19 limited the team’s ability to meter hours of use.

Findings

Figure 3 shows realization rates and associated claimed energy savings for each sampled lighting project.

Figure 3. Lighting—Sample Results



One site exhibited a realization rate of less than 80% and another exhibited a realization rate greater than 120%. Both sample projects were midstream offerings for which the hours of use and baseline fixture wattage were the driving factors behind the variances in realization rate. Midstream lighting projects use a post-purchase application where the customer indicates the quantity of bulbs purchased

from a list of approved bulb types. Pacific Power reported midstream lighting savings as deemed values based on the RTF's midstream Unit Energy Savings (UES) values. Evaluated savings used hours of use specific to the facility type, installation rates from the RTF, and a lumen equivalence method to determine the baseline bulb wattage. Variability in realized energy savings for midstream lighting projects was due to the evaluation's use of project specific values as compared to the reported UES values. Most traditional Wattsmart business lighting projects and small business lighting projects exhibited few deviations in realization rates.

Refrigeration

Pacific Power provided incentives for 110 refrigeration measures in 59 unique projects, consisting of controls, custom projects, and fast acting door upgrades. Pacific Power reported energy savings of 12,140,083 kWh, accounting for 23.3% of all reported energy savings for the 2018 and 2019 program years.

Methodology

Cadmus evaluated 17 refrigeration projects, accounting for 44.8% of all reported energy savings in the refrigeration stratum. All sampled projects involved the installation of fast acting doors, refrigeration equipment upgrades, VFDs installed on refrigeration condenser fans, or refrigeration control upgrades. The program administrator reported savings based on one of three calculation tools for each implemented measure:

- Energy Savings Calculator for Fast Acting Doors.** This workbook is used where a fast-acting door is installed in place of a traditional door for access to refrigerated spaces. The workbook simulates refrigeration energy use based on door characteristics, expected use characteristics, and thermal conditions in the storage space and adjacent spaces. Savings are based on the difference between energy use with a traditional door and a fast-acting door. Documentation for sampled projects typically included PDF exports of the calculation inputs, and Cadmus recreated these calculations to determine evaluated savings.
- Refrigeration Model v5.** This Excel-based simulation workbook performs a variety of energy modeling techniques to simulate energy performance on custom refrigeration systems. The workbook performs multiple calculation iterations to determine energy savings associated with changes to refrigeration equipment and control strategies. For projects where the Refrigeration Model was used to report energy savings, the reported documentation included PDF exports of trend data, calculation inputs, and results. Cadmus was not provided with the Refrigeration Model on any projects and was unable to verify calculation formulas, equipment characteristics, load profiles, or the results used in the calculations on these projects. Sampled projects utilizing the Refrigeration Model v5 workbook account for 46% of sampled savings in the refrigeration stratum.
- Custom calculation.** Custom calculation workbooks were used to calculate reported energy savings on four sampled projects. Cadmus was provided with the custom calculation workbook for one project. PDF documents of spreadsheet calculation inputs and results were provided for

modifications or compressed air system leak repairs. The program administrator reported savings based on one of three calculation tools for each implemented measure:

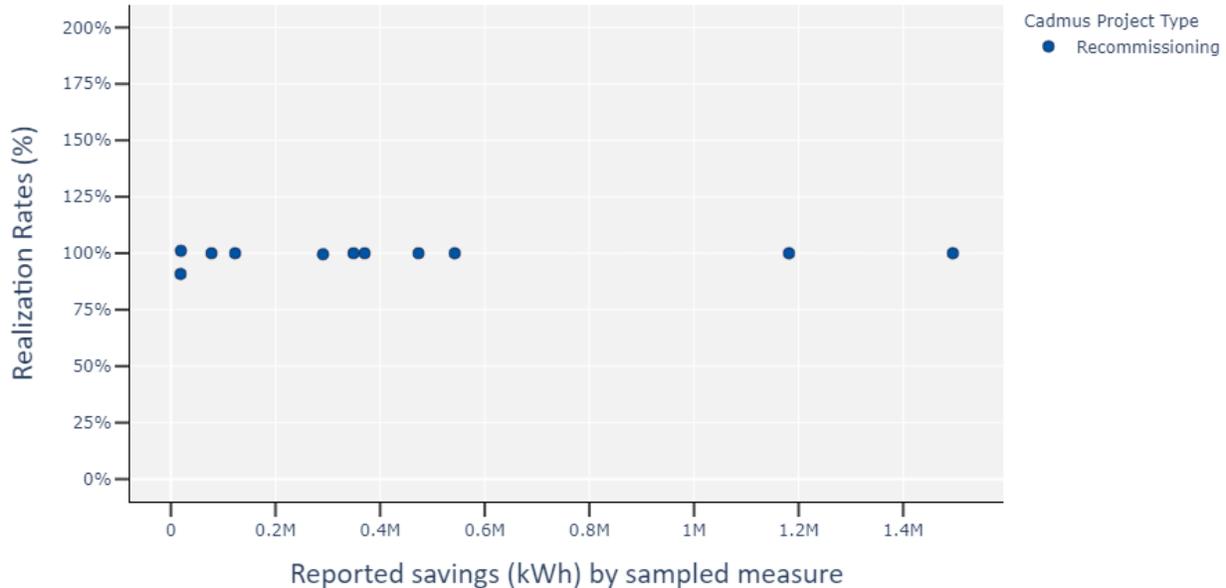
- **Compressed Air Leak Calculator.** This workbook is used to simulate compressed air usage at a plant based on the measured compressed air system pressure, flow (cfm), and compressor system energy use (kW) over a period of two to three weeks. The reduced flow from implementing compressed air system leak detection and repairs is estimated then verified based on post-implementation metering. Cadmus reviewed the provided documentation and found the calculation methodology and measurement and verification plans to be appropriate. However, the unmodified meter data and calculation workbooks were not provided to Cadmus for the evaluation.
- **Refrigeration Model v5.** This Excel-based simulation workbook performs a variety of energy modeling techniques to simulate energy performance on custom refrigeration systems. The workbook performs multiple calculation iterations to determine energy savings associated with changes to refrigeration equipment and control strategies. For projects where the Refrigeration Model was used to report energy savings, the reported documentation included PDF exports of trend data, calculation inputs, and results. Cadmus was not provided with the Refrigeration Model on any projects and was unable to verify calculation formulas, equipment characteristics, load profiles, or the results used in the calculations on these projects. Sampled projects utilizing the Refrigeration Model v5 workbook account for 92% of sampled savings in the energy management stratum.
- **Adaptive Refrigeration Control Energy Savings Estimator v2.1.** This workbook was occasionally used to calculate refrigeration loads and the associated reduced energy use due to implemented energy efficiency measures such as evaporator fan, defrost control, and head pressure reduction. This prescriptive calculator simulated energy use from refrigeration systems when power metering was not utilized to determine baseline energy use.

Cadmus evaluated energy management projects by reviewing the energy analysis and savings verification reports and documenting the equipment quantity, capacity, efficiency, performance characteristics, control strategies, and proposed changes for each energy efficiency measure. The team contacted customers where possible to verify the energy efficiency measures remained in place and were performing as described in the savings verification reports.

Findings

Figure 5 shows realization rates and associated energy savings for each sampled project.

Figure 5. Recommissioning Sample Results



Ten of 11 sampled projects exhibited realization rates of 100%. Setpoint and equipment changes made through the recommissioning effort have been maintained and appeared to operate as intended. Due to the limited visibility into the reported calculation workbooks, Cadmus was unable to confirm the workbook formulas and inputs were applied appropriately. Additionally, the complexity of the systems, measures implemented, and limited data provided also inhibited Cadmus’ ability to create energy model simulations of the systems and/or justify differences between a Cadmus energy model and a Pacific Power energy model.

Compressed Air

Pacific Power provides incentives for custom and prescriptive compressed air projects. In all, Pacific Power provided incentives for 22 measures in 17 projects and reported 2,505,457 kWh in energy savings for the 2018 and 2019 program years, accounting for 4.8% of all reported energy savings in Washington.

Methodology

The Cadmus team evaluated nine compressed air projects, accounting for 81.3% of all reported energy savings in the stratum. For all of these evaluated projects, Pacific Power used a prescriptive calculation workbook (NW Regional Compressed Air Tool). The NW Regional Compressed Air Tool is regularly updated by the program administrator and includes a calculation methodology based on the RTF’s Compressed Air Protocol v2.1 document.⁷

⁷ Regional Technical Forum. May 23 2016. *Standard Protocol for Estimating Energy Savings of Compressed Air Retrofits and Upgrades*. <https://nwcouncil.app.box.com/v/CompressedAirProtocolv2-1>

For all projects, Cadmus reviewed the reported calculation methodology and assumptions to determine their applicability. The prescriptive calculator documents customer information, compressed air system specifications, and expected performance. Critical inputs used to calculate energy savings include the following:

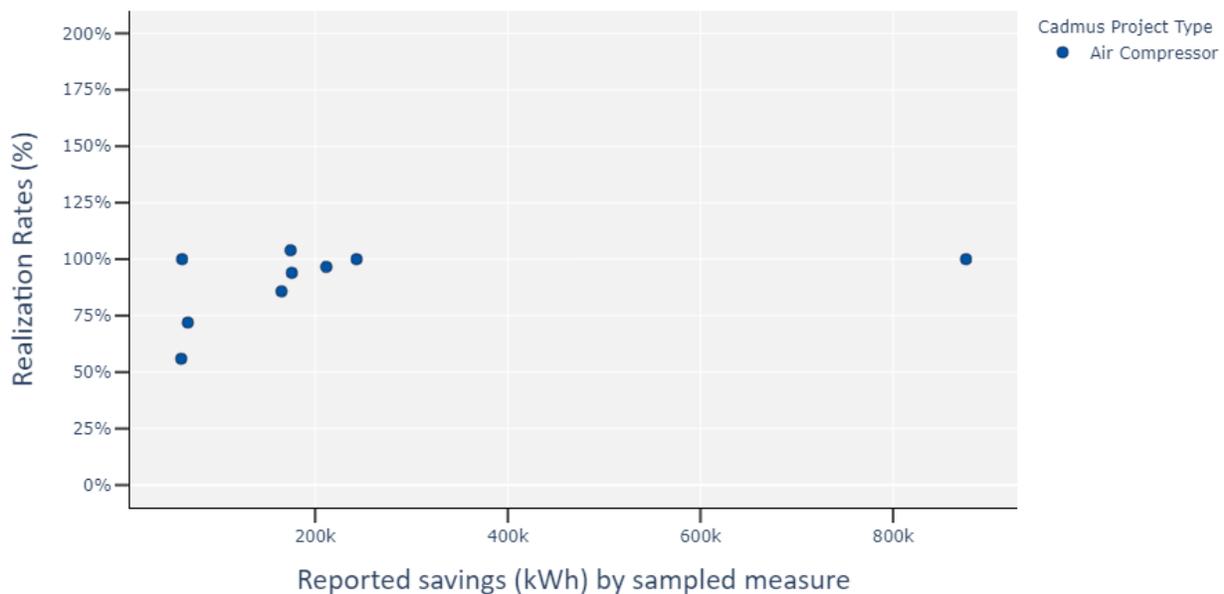
- Compressor type and load control
- Compressor horsepower
- Rated flow
- Receiver volume and dryer specifications
- System pressure setpoints
- Hours of operation

Cadmus attempted to contact all nine customers who received an incentive for compressed air energy efficiency measures. Five customers provided site-specific data that included photos of equipment, photos of system setpoints, and trend data of system performance characteristics. Cadmus calculated energy savings based on the RTF’s Compressed Air Protocol v2.1 and incorporated site-specific findings into the evaluation results.

Findings

Figure 6 shows realization rates and associated energy savings for each sampled project.

Figure 6. Compressed Air Sample Results



Two projects exhibited realization rates below 80%. Details related to these projects are provided in Table 13. The Cadmus team found nominal or no differences in reported savings for the remaining sites.

Table 13. Compressed Air System Sample Results

Project	Project Measure	Reported kWh	Evaluated kWh	Site Realization Rate	Notes
WBWA_267049	30 hp Air Compressor	60,953	34,077	56%	Data provided by customer indicated 25% fewer run hours, and compressor service area was verified to serve one shift instead of two shifts as indicated in the reported documentation.
WBWA_276496	150 hp Air Compressor	67,759	48,761	72%	Reported calculations did not use site-specific compressor specifications. Evaluated savings based on installed compressor CAGI sheet and system pressure setpoints reported by the customer.

The majority of differences between reported energy savings and evaluated energy savings in the compressed air stratum are due to the hours of use and load profiles used in the calculations. When customers reported differences in equipment hours of use or system load profiles, Cadmus asked the customers if the COVID-19 pandemic had any impact on equipment performance. In all cases, customers said reduced hours of use were not due to COVID-19. The program administrator and Cadmus both use the savings calculation methodology outlined in the RTF Compressed Air Protocol, and reported savings match evaluated savings when no discrepancies are observed between installed equipment specifications, hours of use, load profiles, and system setpoints. For two of the nine sampled projects, the equipment specifications for reported calculations did not match the installed equipment and evaluated savings differed from reported savings as a result.

Other

Pacific Power provides incentives for projects in the other category: custom, dishwashers, green motor rewinds, insulation, refrigeration, roof, vacuum pump, and window measures. Overall, Pacific Power provided incentives for 48 measures in 40 unique projects and reported 1,711,630 kWh in energy savings for the 2018 and 2019 program years. Other projects that received incentives accounted for 3.3% of all reported energy savings in Washington.

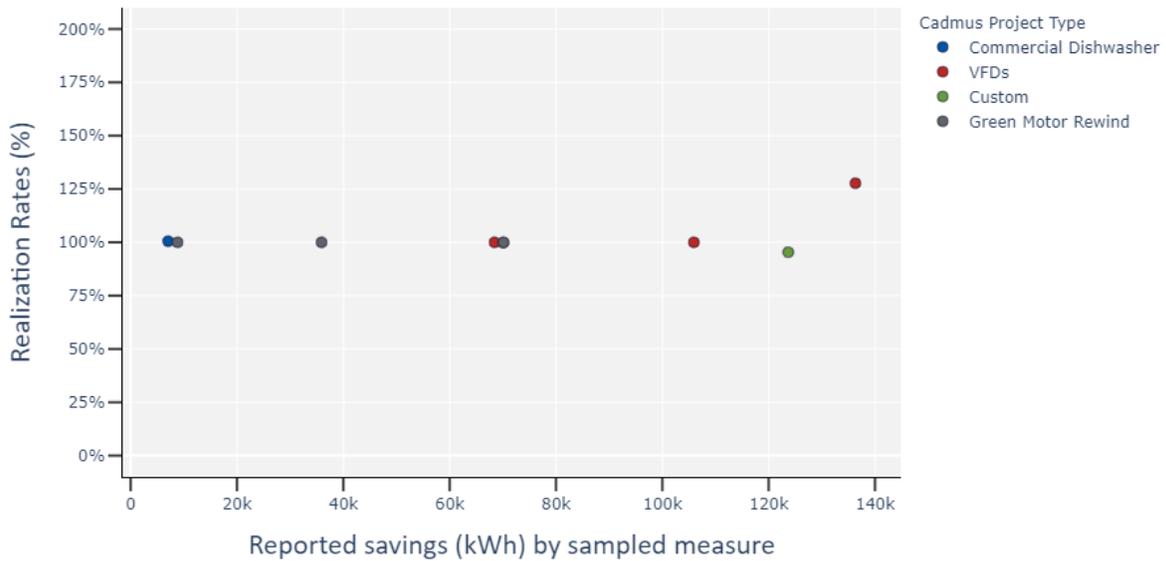
Methodology

Cadmus evaluated nine projects, accounting for 36.6% of the reported energy savings in the other stratum. Sampled projects include green motor rewinds, VFDs, process upgrades, and high-efficiency dishwashers. From the evaluated projects, Pacific Power used deemed savings for five projects and custom calculations for four projects.

Findings

Figure 7 shows realization rates and associated energy savings for each sampled project.

Figure 7. Other Sample Results



One project achieved a realization rate above 120%. Table 14 provides specific details related to this project.

Table 14. Other Sample Detailed Findings

Project	Project Measures	Reported kWh	Evaluated kWh	Site Realization Rate	Notes
WBWA_279624	VFDs	136,313	174,096	128%	Evaluated savings based on control setpoints and load characteristics provided by the customer for a VFD controlling a process motor.

Cadmus found few discrepancies for high-efficiency dishwashers and custom sampled projects. The reported savings for high-efficiency dishwashers match the ENERGY STAR calculation methodology and sufficient documentation was provided. Custom projects used trend data, equipment specifications, and custom spreadsheet calculations for reported savings. Cadmus contacted customers for these projects and verified the reported documentation.

Irrigation

Pacific Power provides incentives for three types of irrigation projects: custom, irrigation pumps, and water distribution equipment. In all, Pacific Power provided incentives for 83 measures in 49 unique projects, reporting 1,515,277 kWh in energy savings for the 2018 and 2019 program years. Irrigation projects that received incentives accounted for 2.9% of all reported energy savings in Washington.

Methodology

To determine savings for irrigation projects that received incentives in Washington, Pacific Power used prescriptive calculations or deemed savings values. The Cadmus team evaluated 14 irrigation projects, accounting for 41.4% of the reported energy savings within the irrigation strata.

Eight evaluated projects involved upgrading or replacing irrigation hardware equipment, including gaskets, sprinklers, nozzles, hoses, and regulators. These projects claimed savings by using a deemed savings value per unit. The team evaluated these projects by using the savings methodology provided in RTF's irrigation hardware measure. Critical inputs to these calculations included the quantity of equipment, hours of operation per season, and pump pressure.

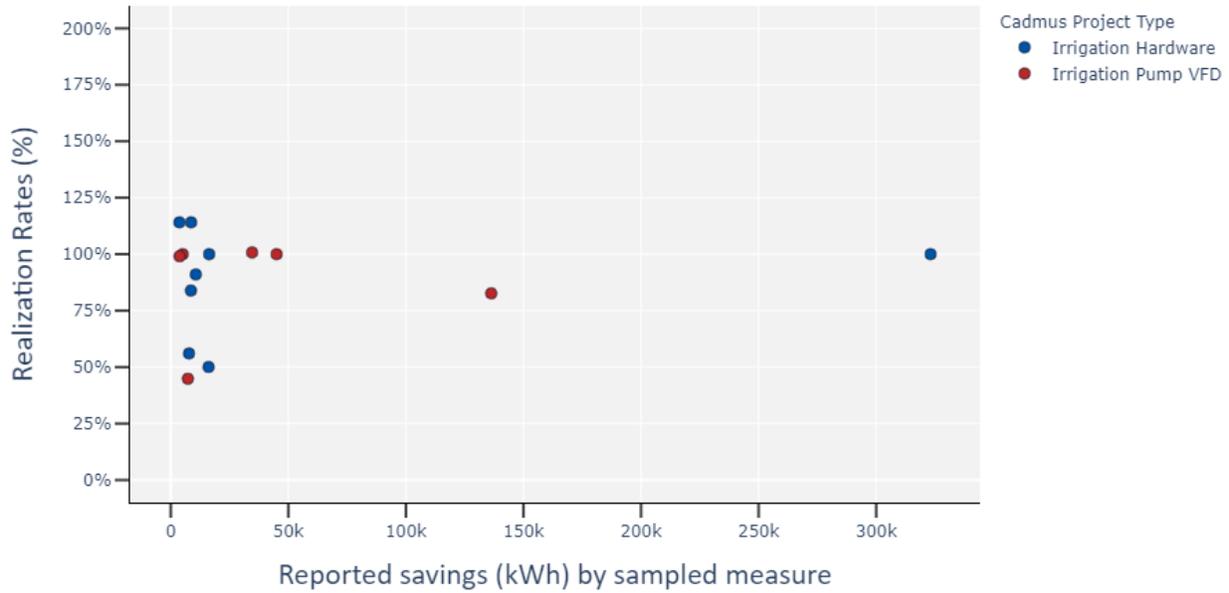
Six projects used prescriptive calculations for installing VFDs on irrigation pumps. The program administrator determined claimed savings using the Irrigation Pump VFD Savings Estimator calculator. Cadmus evaluated savings for these projects by initially reviewing the irrigation calculator for its methodology and assumptions. Cadmus interviewed customers and collected system characteristics including pump pressure, hours of use, flow rates, control methodology, and pump motor characteristics. Cadmus calculated the evaluated energy savings based on data collected from customers and following the irrigation pump savings methodology outlined in the Irrigation Pump VFD Energy Savings Calculations Methodology paper.⁸

Findings

Figure 8 shows realization rates and associated energy savings for each sampled project.

⁸ White, James A., P.E., and Andy Parks. September 3, 2012. *Irrigation Pump Variable Frequency Drive (VFD) Energy Savings Calculation Methodology*. Prepared for Public Utility District No. 1 of Chelan County. <https://www.chelanpud.org/docs/default-source/default-document-library/irrigationpumpvfdenergysavingscalculationsmethodology.pdf>

Figure 8. Irrigation Sample Results



Four sites exhibited realization rates below 80%. Table 15 provides specific details related to these projects.

Table 15. Irrigation Sample Detailed Findings

Project	Project Measures	Reported kWh	Evaluated kWh	Site Realization Rate	Notes
WBWA_267782	Irrigation Pump VFD	7,263	3,256	45%	Customer provided pump control methodology and setpoints resulting in lower energy savings than reported
WBWA_276488	Irrigation Hardware	16,072	8,044	50%	Evaluated savings use the RTF Irrigation Hardware measure savings methodology with calculation inputs based on site-specific findings related to location, pressure, and flow.
WBWA_271325	Irrigation Hardware	7,752	4,345	56%	Evaluated savings use the RTF Irrigation Hardware measure savings methodology with calculation inputs based on site-specific findings related to location, pressure, and flow.
WBWA_235744	Irrigation Pump VFD	136,294	80,561	59%	Customer provided pump control methodology and setpoints resulting in lower energy savings than reported

Further explanations follow for the more atypical measure-level realization rates:

- Pacific Power uses deemed savings for irrigation hardware projects (drop tubes, sprinkler replacement, pressure regulators, etc.). The deemed savings are based average values in the RTF irrigation hardware efficiency measure workbook calculator. The Cadmus team collected site-specific data for irrigation hardware projects including flow rates, system pressure, and hours of use and updated these data points in the RTF workbook to determine evaluated energy savings. Variations in the realization rates for irrigation hardware measures arose from the difference in the average values and the site-specific values in the irrigation hardware calculator.
- Cadmus contacted customers for two projects involving incentivized VFDs serving irrigation pumps. Through interviews and from emailed photos of equipment, Cadmus found that the pump pressure setpoint and pump operation characteristics differed from reported documentation. Cadmus calculated savings based on the collected data and found reduced savings were realized.

HVAC

Pacific Power provided incentives for 62 HVAC measures in 46 unique projects. These projects consisted of controls and thermostats, cooling, custom, heat pump, and motor upgrades. Pacific Power reported energy savings of 891,709 kWh, accounting for 1.7% of all reported energy savings for the 2018 and 2019 program years.

Methodology

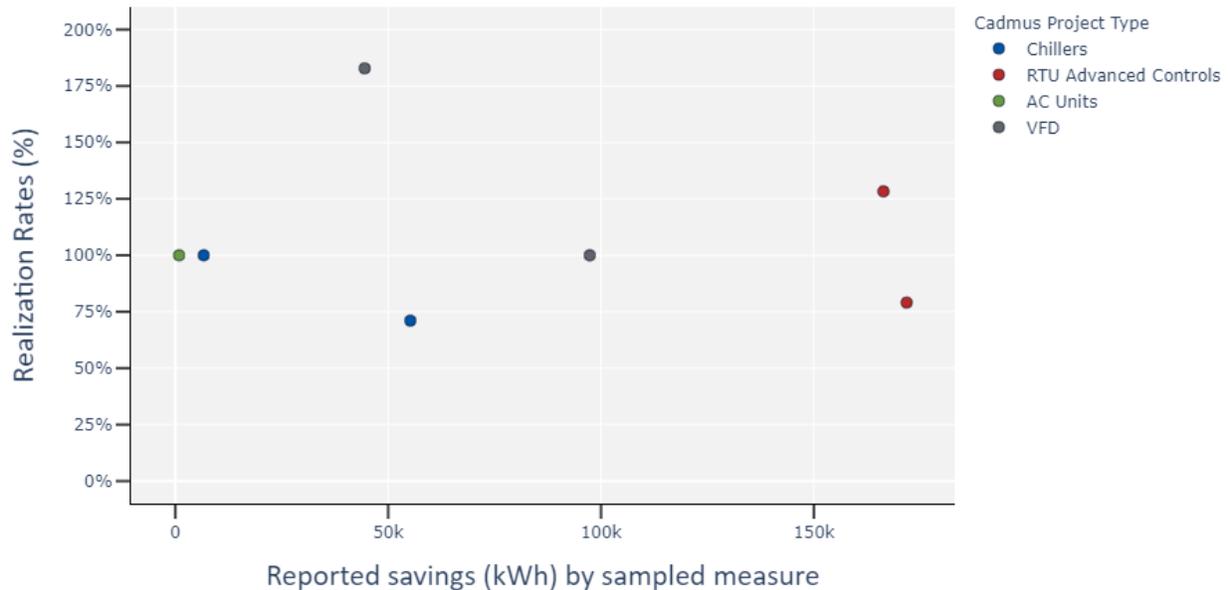
The Cadmus team evaluated seven HVAC projects, accounting for 60.9% of all reported energy savings in the HVAC stratum. Pacific Power used prescriptive calculations for six of the evaluated projects and deemed savings for one project. Pacific Power uses its HVAC calculator, chiller calculator, or Advanced Rooftop Control (ARC) calculator to determine the costs, energy savings, and incentive amounts for prescriptive HVAC projects.

These prescriptive calculators documented the customer information, project location, equipment specifications, and energy savings calculations. The Cadmus team reviewed the methodology and assumptions for each prescriptive calculator to determine the applicability for each project sampled. Where applicable, Cadmus contacted the customers to collect project-specific data, verify calculation inputs, update the prescriptive calculators, and evaluate savings. For projects where the administrator used custom calculations, the team reviewed the energy analysis reports and verification reports for the energy savings methodology, inputs, assumptions, and accuracy.

Findings

Figure 9 shows realization rates and associated energy savings for each sampled project.

Figure 9. HVAC Sample Results



Two sites exhibited realization rates above 120%, and two sites exhibited realization rates below 80%. The Cadmus team found no differences in reported savings for the remaining sites. Table 16 provides specific details for these sites.

Table 16. HVAC Sample Results

Project	Project Measure	Reported kWh	Evaluated kWh	Site Realization Rate	Notes
WBWA_268107	Adaptive Rooftop Controls on RTUs	171,804	135,836	79%	Reported savings based on Pacific Northwest National Laboratory (PNNL) study on advanced rooftop control. Cadmus evaluated savings based on ARC measure from the NW Council’s Seventh Power Plan. Lower savings from the Seventh Power Plan indicate lower realized energy savings.
WBWA_228863	20-ton process chiller 40-ton air cooled chiller	55,205	39,229	71%	Custom chiller project where the calculated cooling load for the facility was miscalculated between the baseline and post-implementation conditions.
WBWA_308053	Adaptive Rooftop Controls on RTUs	166,352	213,478	128%	Reported Savings based on PNNL study on advanced rooftop control. Cadmus evaluated savings based on ARC measure from the NW Council’s Seventh Power Plan. Lower savings from the Seventh Power Plan indicate lower realized energy savings.
WBWA_222724	VFD serving HVAC fan	44,480	81,320	183%	Evaluated savings based on Cadmus VFD analysis workbook. Those assumptions resulted in savings much higher than reported.

Both projects that exhibited high realization rates were VFD projects installed on HVAC fans. For deemed savings, Pacific Power uses 1,082 kWh per controlled motor horsepower for VFDs installed on HVAC fans and 996 kWh per controlled motor horsepower for VFDs installed on HVAC pumps. The team evaluated these projects by referencing a 2014 variable-speed drive load shape study and applying deemed savings specific to HVAC supply fans, return fans, and exhaust fans.⁹ The revised deemed savings were higher than Pacific Power's deemed savings.

One custom chiller plant project involved the addition of a process chiller and reconfiguration of existing cooling plant equipment to satisfy the comfort cooling and process cooling loads. Cadmus found that reported calculations estimated a lower total cooling load for the facility than would be expected based on the implemented measures. The project resulted in more efficient use of the chiller plant equipment; however, the total cooling load to the facility was not reduced. Cadmus simulated energy use with equivalent cooling loads and found lower energy savings could be realized.

Two projects involved implementation of adaptive rooftop controls (ARCs) on rooftop air handling units. Pacific Power reported savings as 703 watthours per runtime hour per supply fan horsepower based on a Pacific Northwest National Laboratory (PNNL) document titled, *Advanced Rooftop Control (ARC) Retrofit: Field-Test Results (PNNL-22656)*.¹⁰ The Northwest Council conducted an analysis of the ARC measures in the Seventh Power Plan and established savings as 515 watthours per runtime hour per supply fan horsepower. Cadmus evaluated savings based on the Seventh power plan resulting in lower realized energy savings.

⁹ Cadmus. *Variable Speed Drive Loadshape Project*. August 2014. <https://neep.org/variable-speed-drive-loadshape-study-final-report>

¹⁰ Pacific Northwest National Laboratory. *Advanced Rooftop Control (ARC) Retrofit: Field-Test Results (PNNL-22656)*.

Process Evaluation

Cadmus conducted an intensive process evaluation for the 2016-2017 cycle that included detailed documentation of administrative structures, marketing, data storage, and reporting. For the 2018-2019 cycle, Cadmus conducted a more limited process evaluation that focused on recent changes to program design or implementation and the response to those changes from trade allies and participants. Findings are based on an analysis of data collected through interviews with program and administrator staff and trade allies and surveys of participants, partial participants, and nonparticipants. Through these research tasks, the team assessed the following:

- Effectiveness of the program’s design and processes
- Participant’s customer experience and satisfaction
- Barriers to customer participation

Table 17 lists the questions asked in the primary research areas. Although data collection occurred during the COVID-19 pandemic, survey and interview instruments tried to focus respondents on their experiences with the program in 2019 and did not address the events or situations occurring in 2020.

Table 17. Process Evaluation Research Areas and Questions

Research Areas	Researchable Questions and Topics
Program Status	How did the program perform in 2018 and 2019, and what opportunities and challenges do program staff foresee for future program years?
Awareness	How did customers learn about the Pacific Power Wattsmart Business program incentives?
Participation/Motivations and Barriers	What are the key factors influencing participants’ decision to participate in the program? What are the key factors in any customer’s decision to install energy efficiency improvements? What are the participation barriers for participants and nonparticipants?
Satisfaction	How satisfied are participants with the program and with the program measures, incentives, and services?
Firmographics	What are the business characteristics of participants in each program offering? How do participant awareness and business size compare by program delivery channel?

Methodology

The following sections provide an overview of the methodology the Cadmus team used to conduct a process evaluation of program performance in 2018 and 2019.

Materials and Database Review

The Cadmus team conducted a review of several program documents and files to inform development of data collection instruments, survey samples, and data analysis:

- Washington Annual Report on Conservation Acquisition (for January 1, 2018, to December 31, 2018, and for January 1, 2019, to December 31, 2019)
- Wattsmart Business program website
- Participant and partial participant databases
- Pacific Power’s nonresidential customer database

Utility and Administrator Staff Interviews

The Cadmus team developed stakeholder interview guides and collected information about key topics from program management staff. The team conducted three interviews, one each with program staff at Pacific Power, Nexant, and Cascade Energy, focusing on changes during 2018 and 2019 and covering these topics:

- Program goals and performance
- Program design and implementation changes
- Marketing and outreach
- Program delivery and management
- Data management and quality assurance
- Barriers and areas for improvement

Trade Ally Interviews

Cadmus interviewed seven participating Pacific Power Wattsmart Business trade allies from Washington to understand their participation experience and gather insights about improving the experience for customers and vendors. Interviews sought to answer specific research questions regarding program function and how changes have impacted trade ally use and to collect feedback about the overall experience.

The Cadmus team targeted a census of active participating contractors and installers (defined as participating trade allies who had completed jobs during the 2018-2019 program cycle). At the time the team performed the interviews, 20 of the 43 Washington trade allies listed on the Pacific Power website had completed a project in 2018 or 2019. The team used contact information provided by Nexant and sent a first round of email invitations and supplemented with follow-up calls where necessary to schedule the phone-based interviews. Table 18 shows the total available contacts for trade allies in Washington, targets, and completes.

Table 18. Trade Ally Interviews for the 2018-2019 Process Evaluation

Total Active Participating TAs	Target Completes	Actual Completes
20	9	7

Surveys

The Cadmus team completed online and phone surveys across three customer populations: participants, partial participants, and nonparticipants.

Participant Surveys

The team designed survey instruments for each major offering (Typical Upgrades and Custom Analysis incentives, Small Business Enhanced incentives, and Lighting Instant incentives) to collect data about the following process evaluation topics:

- Customer perceptions and motivations
- Program awareness
- Reasons and motivations for participation
- Perceived value of the program
- Customer experience
- Effectiveness of program delivery, including marketing, outreach, and delivery channels
- Customer interactions with trade allies, program staff, and program-funded third-party technical service providers
- Customer satisfaction regarding specific program elements and the Wattsmart Business program overall
- Customers' participation challenges
- Customer firmographic information

In the sample frame, Cadmus included only 2019 participants, considering that participants would no longer accurately remember the circumstances of projects completed in 2018 by the time of the survey. To prepare the sample frame, the team first removed records with no email address. Next, the team selected an individual record for each email contact in the participant tracking data. Where a group of records had the same contact information, the team first identified the measure category in the group that had the lowest representation in the sample frame then randomly selected one record from that measure category.

The sample frame included these measure categories, from highest priority (smallest population) to lowest priority (largest population):

- | | |
|---------------------|--|
| • Compressed Air | • Agricultural |
| • Energy Management | • Lighting (Lighting Instant Incentive) |
| • HVAC | • Lighting (Small Business Enhanced Incentive) |
| • Other | • Lighting (Typical Incentives) |
| • Refrigeration | |

The survey was conducted online. Survey invitations were emailed to the entire sample to collect as many responses as possible. The initial online survey did not achieve the target of 52 completes for Typical Upgrades and Custom Analysis incentives and achieved six completes for Small Business Enhanced and two completes for Lighting Instant incentives.

To supplement the number of completed surveys, Cadmus followed up with Typical Upgrades and Custom Analysis participants who had not yet responded to the email outreach. The team prioritized Typical Upgrades and Custom Analysis projects because they are more variable and encompass a broader range of customer experiences. Including both email and phone responses, the team received 24 survey completes for Typical Upgrades and Custom Analysis, which represented a response rate of 16%.

Nonparticipant and Partial Participant Surveys

Cadmus' survey implementation contractor, VuPoint, conducted a telephone survey with 200 nonparticipants and two partial participants. The survey addressed these process evaluation topics:

- Customer perceptions and motivations:
 - Program awareness
 - Reasons for and barriers to making energy-efficient improvements
 - Likelihood of requesting an incentive in the future
- Customer experience: reasons partial participants did not complete specific projects
- Program influence: savings spillover
- Customer information: firmographic information and fuels used for space and water heating

To create the sample frame, the team removed participants and partial participants from the master list of nonresidential customers provided by Pacific Power. From the remaining population, VuPoint randomly called nonparticipants until the quota of 200 was reached.

Pacific Power, Nexant, and Cascade provided the Cadmus team with lists of 2018 and 2019 partial participants from each of their respective program responsibility areas. The team checked this list against a list of program participants, removing any customers who, within that same timeframe, appeared on the participant list for another project. This eliminated the possibility of double-sampling these individuals.

The team also removed any accounts designated as on hold and any managed accounts identified by Pacific Power. For partial participants who began but did not complete multiple projects during the evaluation period, the team included the project with the greatest estimated kWh savings. The sample frame included all available contacts. From a total of 19 contacts in Washington, Cadmus completed two surveys.

Program Implementation Changes

Drawing on stakeholder interviews, this section describes changes in the Wattsmart Business program's implementation and delivery during the 2018-2019 evaluation period.

Administrator Roles

The most significant change in program administration in 2018-2019 was the shift in administrator roles to include direct project facilitation, inspection, and verification for managed accounts.¹¹ Pacific Power rebid the nonresidential program administration contracts in 2018 and included portions of the scope of services for managed accounts that had previously been provided by an in-house project manager. Because its in-house project manager has valuable relationships and trust built up with managed account contacts, Pacific Power continues to provide outreach and coordination of managed account energy efficiency projects directly.

The managed account project manager conducts initial outreach to customers and schedules one or more meetings to discuss potential energy efficiency opportunities. Once the customer has expressed interest in a specific opportunity, Cascade Energy or its subcontractors provide engineering services to define the project, estimate energy savings, and determine the incentive offer. The managed account project manager continues to serve as the point of contact and presents the customer with the defined project scope and incentive offer. Once the customer agrees to the proposal, Cascade Energy provides continuing technical support and inspection, verification once the project is complete.

The Pacific Power project manager reviews and approves project for processing of the incentive payments. Cascade Energy reports that the new arrangement has worked well, reducing the administrative burden on Pacific Power staff and streamlining the process to identify projects.

The new administrator contracts introduced other small improvements that also streamlined oversight for Pacific Power. The new contract combined targets for midstream and Typical Upgrades and Custom Analysis lighting savings, which gave the administrators greater flexibility to promote each offering where and how appropriate rather than having to force the market toward one over another just to hit a target. In addition, Pacific Power has fewer metrics to track, and all incentives are provided in a single invoice rather than two.

In Washington, Pacific Power also partners with National Energy Improvement Fund, a financing brokerage service that specializes in financing for energy projects, to help customers find affordable, flexible financing for projects they complete using one of the Wattsmart Business offerings. Pacific Power is not a party to this financing, but promotes National Energy Improvement Fund on its website as a service to customers.

Updates to Program Offerings

The Small Business Enhanced Incentive addresses the greater burden that high upfront costs represent for many cash-strapped small businesses, by providing greater incentives amounts for lighting upgrades to eligible small business customers. To access the Small Business Enhanced Incentives, small businesses must work with a program trade ally (specifically approved for the small business offer), which ensures they are able to identify opportunities for lighting savings and select qualifying equipment.

¹¹ Managed accounts are typically accounts larger than 1 MW.

In 2019, Pacific Power and Nexant, the administrator of the commercial trade ally network, implemented lead generation support to encourage trade allies to promote the Small Business Enhanced incentive. Nexant targeted 15 eligible customers for each participating trade ally and mailed the 15 companies to explain that the trade ally would be calling to offer enhanced incentives. Trade allies commit to call each customer within a defined period of time. Once the customers were contacted, the trade ally could request another round of postcard mailings.

Pacific Power also gave these trade allies a co-branded polo shirt to reinforce their connection to Pacific Power and the program during their sales call. Staff said the initiative has been well-received by trade allies and has improved close rates when pitching lighting upgrades. In interviews with Cadmus, trade allies confirmed that the program has been helpful to them (see additional discussion in the *Trade Ally Experience* section.)

Participation

Table 19 shows the number of unique customers participating, the number of projects, and the reported savings by offering and measure and in total, in 2018 and 2019. Together, these three metrics provide useful context to understand the results of the process evaluation.

Table 19. 2018-2019 Wattsmart Participation by Year and by Offering

Offering	Measure Category	Unique Customers (Unique Accounts)*		Total Projects ^a		Reported Savings (MWh)	
		2018	2019	2018	2019	2018 MWh	2019 MWh
Lighting Instant Incentive (Midstream)		38	47	90	67	1,342,105	929,247
Small Business Enhanced Incentive		29	71	32	78	404,803	1,052,067
Typical Upgrades and Custom Analysis Incentives	Lighting	177	114	225	124	14,774,000	8,937,781
	Refrigeration	31	22	35	24	8,918,159	3,221,924
	Energy Management	9	9	10	9	2,539,217	3,270,087
	Compressed Air	6	10	6	11	1,353,235	1,152,222
	Other	20	15	24	16	1,134,513	577,117
	Agricultural	16	28	17	32	417,195	1,098,082
	HVAC	9	31	9	37	343,286	548,423
Total		310	347	442	394	31,226,512	20,786,950

^aThe total reflects the total number of unique customers participating in any Pacific Power program; this value is less than the sum of the rows because some accounts are counted multiple times due to participation in multiple programs or measures.

The number of unique participants increased slightly in 2019 relative to the previous year, but the total projects and total savings decreased, by 11% and 33% respectively. The decrease in savings was driven primarily by a reduction in the number of Typical Upgrades lighting projects, and a decrease in both the number and savings per project of refrigeration projects. Although the program also saw significant increases in savings from Small Business Enhanced Incentives, energy management, and irrigation and HVAC projects, these increases were not enough to offset the decreases.

Trade Ally Experience

This section summarizes the key findings from interviews with seven of 20 trade allies active in Pacific Power's Washington territory, including three lighting installers and four lighting distributors. The interviews were conducted to understand their participation experience and gather insights about how the experience can be improved for customers and vendors. The interviews addressed the following research questions:

- What do companies expect from participation?
- What aspects of the program work well?
- How have recent program changes impacted trade ally use of programs?
- Are there opportunities for improvement? Where do trade allies need more support?
- What feedback can trade allies offer on customer response to program changes?
- Do trade allies have ideas for new products?

Program Participation

The interviewed trade allies said they joined the Wattsmart program for two main reasons. The first was that the incentives were beneficial and provided a more attractive offering to customers. The second reason was that the program brought them more business.

Cadmus asked trade allies how the Wattsmart program fit with their business model, and six said it fit well or was an integral part of their system. One lighting installer said the program does not currently fit well into the company's sales model but that the company is also still trying to grow its business in Washington. One trade ally noted "[Wattsmart is] a clear program that makes a lot of sense." He added that understanding the rules of the program is easy and materials such as fliers are laid out well.

In Washington, two of the three lighting installers mentioned they were aware of and participated in the postcard campaign. One of the installers noted that the shirts Pacific Power provided give them more legitimacy when interacting with customers. The other installer said that giving advance notice to customers before they show up adds credibility to their efforts. They also noted that bill inserts included in customer's power bills help increase awareness of the program. The third lighting installer said they were not aware of the postcard campaign.

Of the seven trade allies, three had heard of the quarterly scorecards but two of these respondents also said they did not use them often. One lighting installer said he had been viewing the quarterly scorecards and occasionally had questions but had not put in much time to understanding them more.

Areas for Improvement

Cadmus asked the trade allies what barriers they have experienced and if they would add any products to the Wattsmart program. All said they were satisfied with the program. One distributor was aware that Pacific Power is developing an online portal for application and requested that the portal design prioritize a user-friendly interface. The distributor said the portal would make managing the paperwork easier, but also expressed some concern that it would reduce the amount of time he spent interacting

face-to-face with his customers. Another distributor reported sometimes having issues with updating forms for jobs as forms had changed during the project.

Two lighting installers mentioned that the small business usage threshold for eligibility leaves out some convenience stores and minimarts. Financially, these businesses are typically considered small; however, because they are open 24 hours, seven days a week, their power usage may make them ineligible for small business incentives. One of these installers added that when these sites do qualify, he may have to submit two separate applications, with two separate workbooks, in order to access all available incentives for the customer. This is necessary because some efficient lighting such as refrigerator case lighting or exterior lights, are not included in the Small Business Enhanced Incentives offering.

Customer Response – Participants

The Cadmus team conducted an online survey with participants in the Typical Upgrades and Custom Analysis offerings, the Small Business Enhanced Incentives offering, and the Lighting Instant Incentives offering. Because of the low number of completes, findings should be viewed as qualitative information and may not represent the population of participants. (See the *Process Sample Design and Data Collection Methods* section for sample details.)

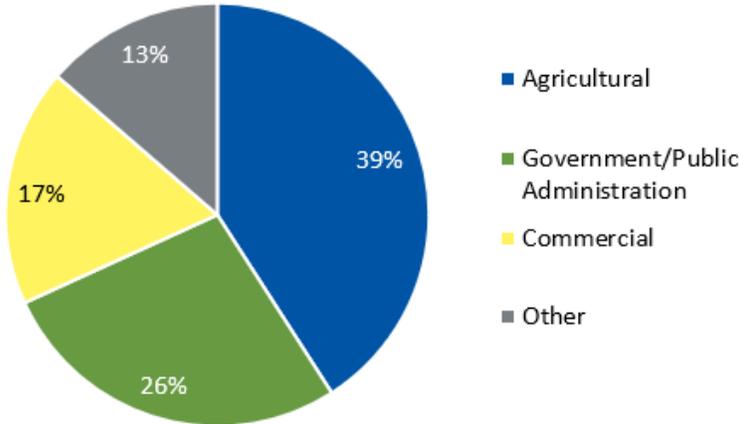
Wattsmart Business Typical Upgrades and Custom Analysis

The Cadmus team surveyed participants from four measure categories:

- Lighting (12)
- Agricultural (8)
- Refrigeration (4)

The 24 survey respondents fell into four business sectors: agricultural, government/public administration, commercial, or other, as shown in Figure 10. Business sizes were relatively diverse, 35% of respondents said their company employs zero to 10 employees, 26% reported 11 to 50 employees, and 39% said 76 or more employees (n=23). Thirty-nine percent of respondents said their company uses gas for space heating at their facility, 30% used electricity, and the remaining respondents said the facility had a mixture of both or no space heating (n=23). Fifty-two percent reported using electricity for water heating at their facility, while 19% use gas and 29% use a mixture of both or do not have water heating (n= 21).

Figure 10. Respondents by Business Sector

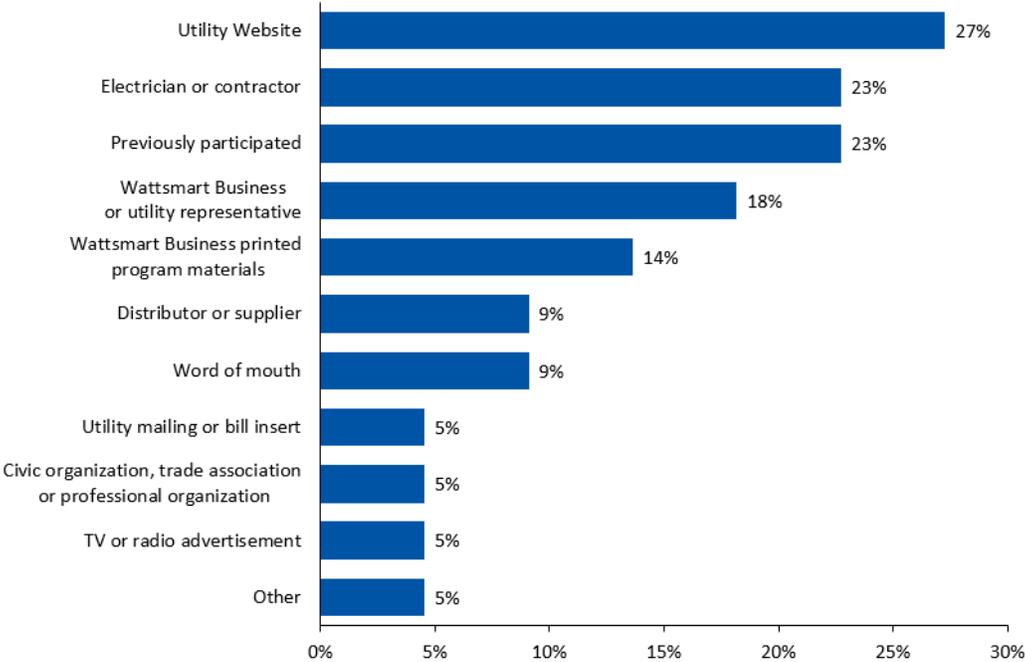


Source: Pacific Power Wattsmart Business Program 2018-2019 Wattsmart Business Participant Survey QE1. (n=23)

Awareness and Communication

Typical Upgrades or Custom Analysis respondents most frequently learned about the available incentives through the Pacific Power website (27%, n=22), as shown in Figure 11. Additional sources of information were commonly identified included electricians or contractors, previous participation, and Wattsmart Business or Pacific Power representatives.

Figure 11. Typical Upgrades and Custom Analysis Participants Information Sources



Source: Pacific Power Wattsmart Business Program 2018-2019 Wattsmart Business Participant Survey QA4. Don't know and refused responses removed. Multiple responses allowed. (n=22)

Customer Experience

Cadmus identified three key metrics that provide a high-level picture of how participants are engaging with the Wattsmart Business programs and application processes: how much of the project cost is covered by incentives, who installed the measure, and who filled out the application. These metrics were not captured in previous surveys, but Cadmus intends to continue to monitor them moving forward.

Most respondents said their incentive covered 25% or less of their project cost (57%, n=14), while 29% of respondents said it covered 26%-50% of their project cost and 14% said it covered 50-100%. Among the 8 respondents who said the incentive covered 25% or less of their project cost, 3 said they were *very satisfied* with the dollar amount of their incentive and 5 said they were *somewhat satisfied*.

Respondents who said they were less than *very satisfied* were asked what incentive amount would have been enough to increase their satisfaction. Respondents gave answers that ranged from an incentive increase of 5%-20%. All respondents who said the incentive covered more than 25% of their project cost reported being *very satisfied* with the dollar amount of their incentive.

Fourteen of 18 respondents said their projects were primarily installed by an independent contractor rather than by themselves (two respondents) or a Wattsmart Business program participating trade ally (two respondents).

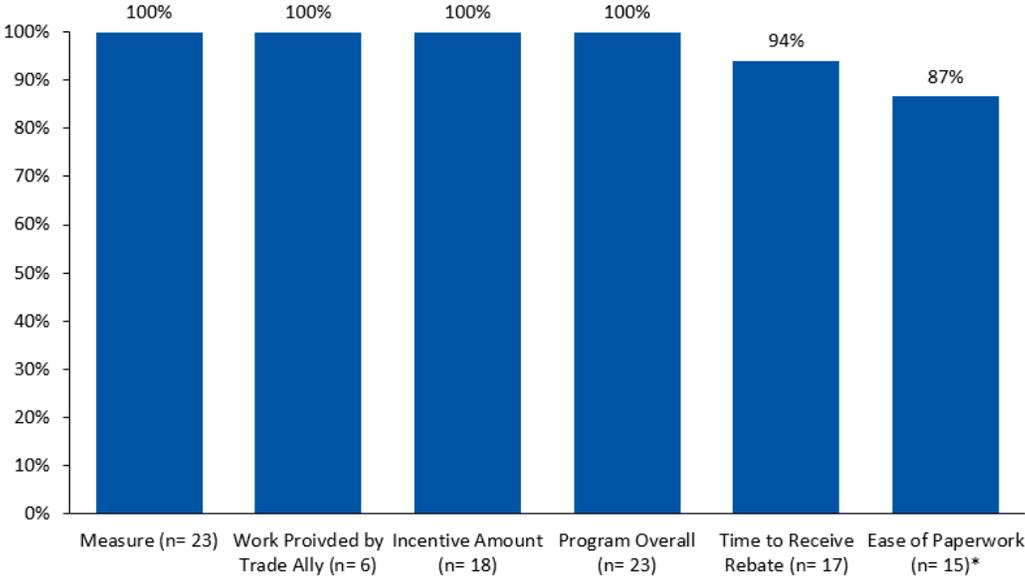
Ten respondents said they or someone else at their company completed their applications, six said a contractor or installer completed it, two said their Pacific Power account representative, and one said a Wattsmart Business representative or Energy Engineer (n=19).

Satisfaction and Challenges

As shown in Figure 12, 100% of participants were satisfied (either *very satisfied* or *somewhat satisfied*) with the measure they installed, their incentive amount, and the program overall. In addition, all six respondents who worked with a Wattsmart trade ally to install their project were satisfied with the trade allies' work. Ninety-four percent reported they were satisfied with the time it took to receive their rebate (n=17). Eighty-seven percent of respondents reported their paperwork was either *very easy* or *somewhat easy* to complete. Both respondents who said their paperwork was *not too easy* to complete reported they or someone else at their company took the lead role in filling out their application.

Three respondents provided additional explanations for why they found completing the paperwork to be less than *very easy*. One respondent said, "Our issue was more to do with the large scope of the project and lack of good inventory records on our part and Pacific Power's part." Another said there was miscommunication with the project and that the incentive had to be applied for retroactively. The third respondent had to call to get information properly calculated.

Figure 12. Participant Satisfaction Levels

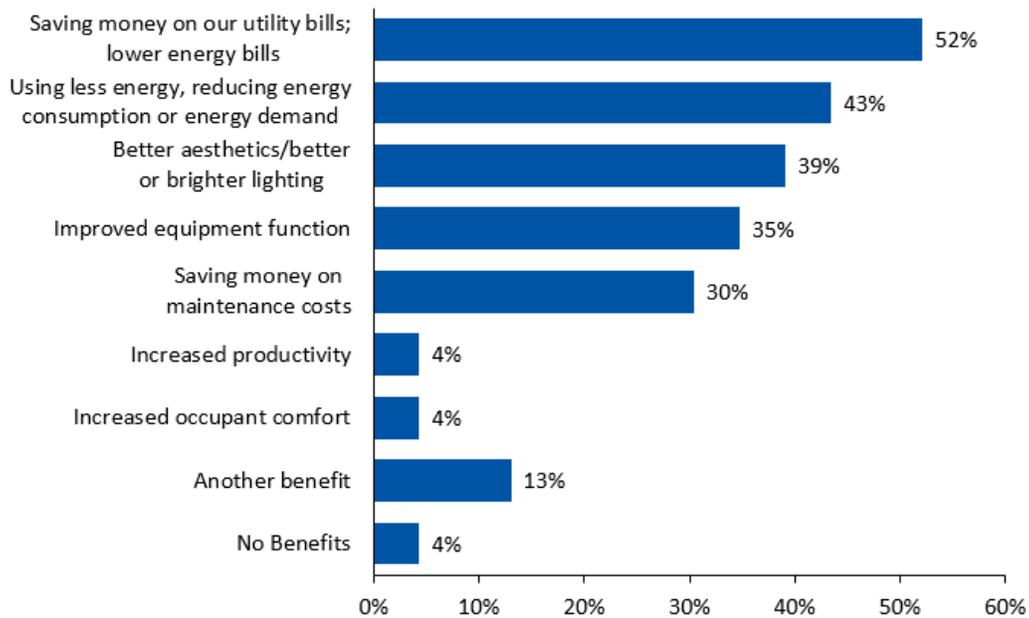


Source: Pacific Power Wattsmart Business Program 2018-2019 Wattsmart Business Participant Survey QB2, QCB4, QB7, B10, and QB12. Don't know and refused responses removed. *Rating scale measured "easy" rather than "satisfied"

Project Benefits

Twenty-two of 23 Typical Upgrades or Custom Analysis participants reported one or more benefits that their companies experienced due to the equipment they installed. Most respondents said benefits were lower energy bills or reduced consumption. As shown in Figure 13, participants also reported operational benefits such as better or brighter lighting, improved equipment function, and saving money on maintenance costs. Across all 23 respondents, 87% reported some benefit from their project other than energy cost savings.

Figure 13. Benefits of Equipment Installed



Source: Pacific Power Wattsmart Business Program 2018-2019 Wattsmart BusinessParticipant Survey QB14. Don't know and refused responses removed. Multiple responses allowed. (n=23)

Small Business Enhanced Incentives

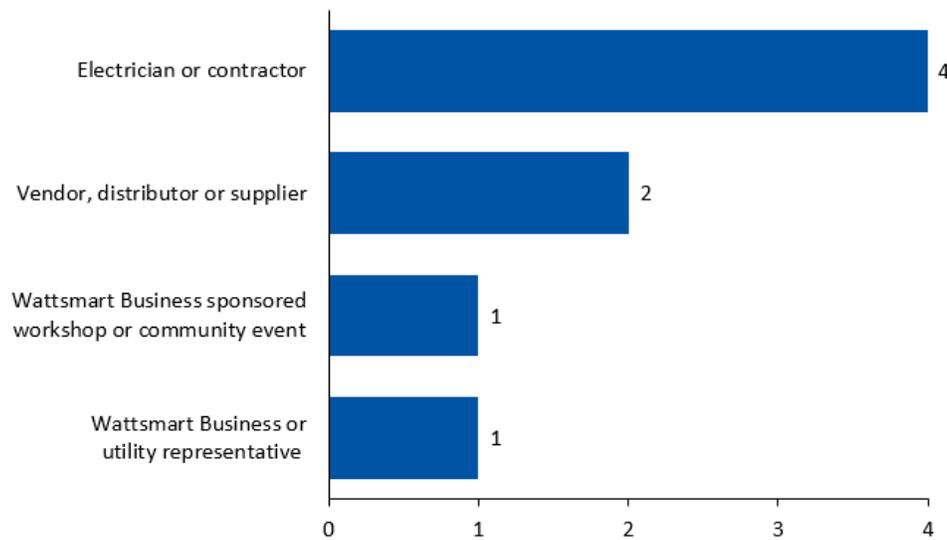
Six Small Business Enhanced Incentives participants completed the survey. Five worked in the commercial business sector and one was classified as “other.” Of five respondents, three owned their facilities and two leased. Four respondents said their company employs between one and 10 people, and two said 11 to 25 people.

Four respondents said they use gas for space heating at their facility, and two said their companies use electricity. Four respondents reported using electricity for water heating, and one reported using gas.

Awareness and Communication

Small Business Enhanced Incentives participants most commonly became aware of the program through their electrician or contractor. Figure 14 shows a breakdown of all awareness channels.

Figure 14. Sources of Program Awareness Among Small Business Enhanced Incentives Participants



Source: Pacific Power Wattsmart Business Program 2018-2019. SBEI Participant Survey QB1. Don't know and refused responses removed. Multiple responses allowed (n=6).

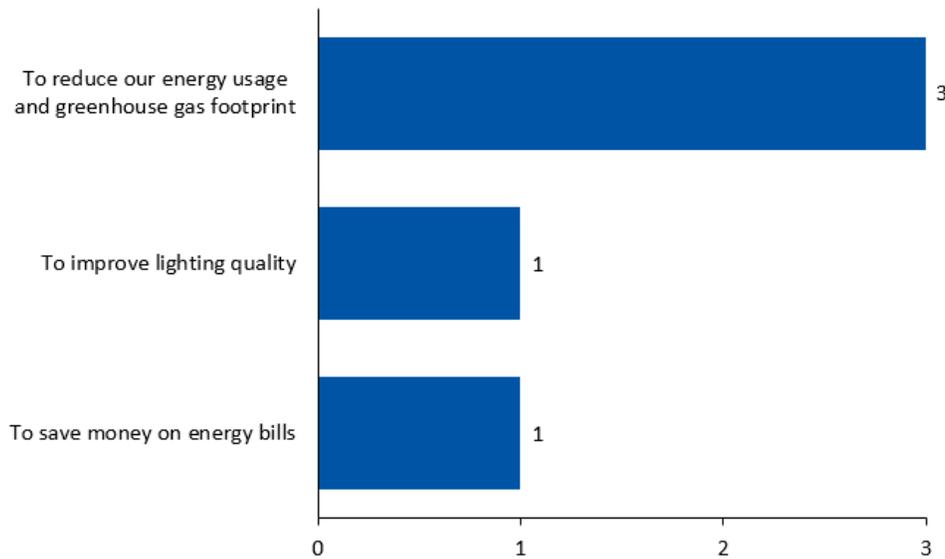
Motivation and Participation

Figure 15 shows the most important factors in companies' decisions to participate in the Small Business Enhanced Incentives offering. Three of five respondents cited reducing energy usage and greenhouse gas footprint as the most significant factor in making their decision.

Four respondents said that after their energy assessment they received a project proposal with estimates of their incentive or discount and utility bill savings (two did not respond). Of these four respondents, two said information on project cost savings the most influential information in the proposal, and two said it was utility bill and energy savings.

One respondent out of the six said the company wanted to install other lighting equipment (lighting covers) not offered in the project proposal.

Figure 15. Motivation to Participate



Source: Pacific Power Wattsmart Business Program 2018-2019. SBEI Participant Survey QB2. Don't know and refused responses removed. Selected Choice (n=5).

Satisfaction

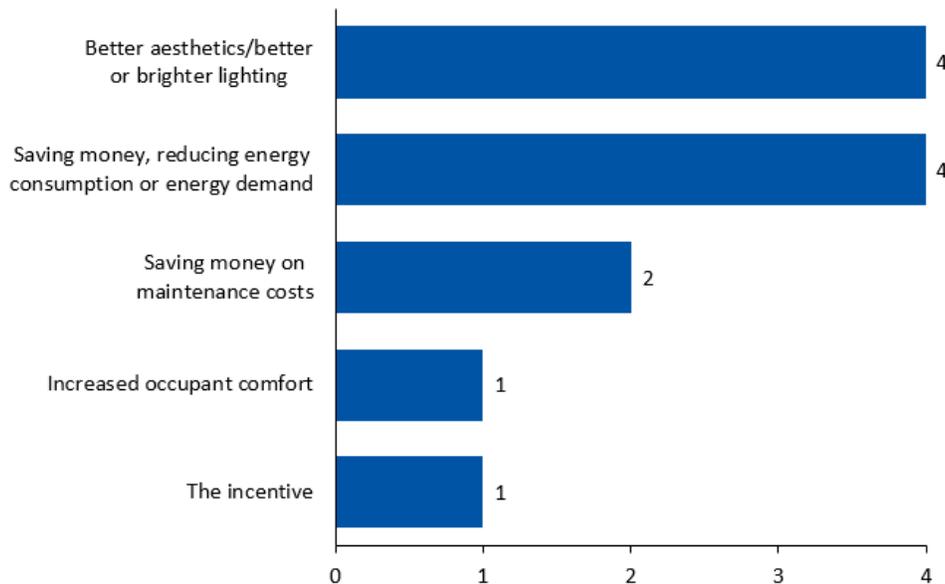
Respondents were asked to rate their satisfaction with several program aspects and with the program overall. Satisfaction levels were high for the program, and all three of its components received 100% satisfaction.

One respondent was *somewhat satisfied* with the ease of scheduling the facility assessment. This respondent said the appointment was scheduled months in advance and wished for better availability. Another respondent was *somewhat satisfied* with the work provided by the contractor and said the contractor left a mess in the office after completing the project.

Benefits and Challenges

Three of six respondents identified more than one benefit from participating in the Small Business Enhanced Incentives offering. None said their company received no benefits. As shown in Figure 16, most Small Business Enhanced Incentives respondents said benefits were better aesthetics/better or bright lighting and saving money.

Figure 16. Customer-Reported Benefits of Equipment Installed Through Small Business Enhanced Incentives



Source: Pacific Power Wattsmart Business Program 2018-2019. SBEI Participant Survey: QB17. Don't know and refused responses removed. Select up to three (n=6).

When asked if they had encountered any challenges to participating in the Small Business Enhanced Incentives offering, only one respondent had (n=6). This respondent reported being unaware the offering was limited to lighting; the respondent had discussed HVAC improvements with the energy consultant but was unable to complete that part of the project. When asked what Pacific Power could do to help overcome these challenges, the respondent suggested: "Training and encourage consultants to help customers with non-lighting improvements." No other respondents offered suggestions for improvement or recommendations.

Lighting Instant Incentives

The Cadmus team received two responses from customers who participated in the Lighting Instant Incentive (Midstream) program. Both respondents were commercial businesses who own their facilities. One respondent's company employed between 26 and 50 people. Both respondents said their organization uses gas for space heating. One said the company uses gas for water heating and the other said the company uses electricity.

Awareness and Participation Experience

One respondent learned about available incentives through either the contractor or distributor/supplier where they purchase equipment. The other respondent learned about the incentives through contact with a Wattsmart Business or utility representative.

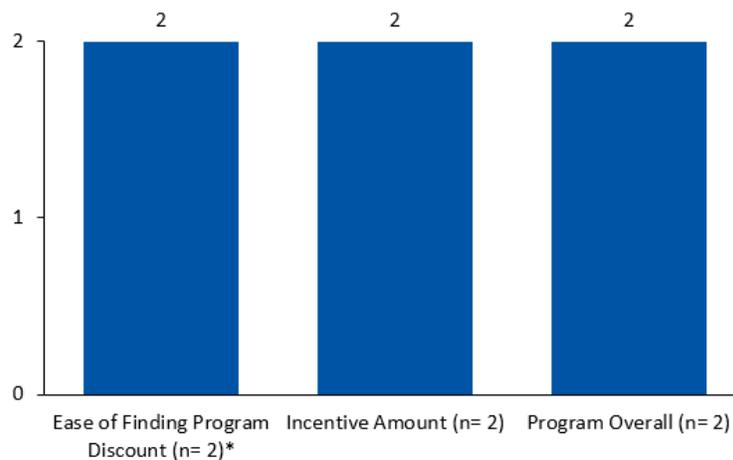
Respondents were also asked about their main reasoning for purchasing their equipment. Both said they were re-lamping an area of their facility as part of ongoing maintenance. They also said they purchased their equipment from a contractor or distributor/supplier they had worked with in the past. However,

both also said they chose their supplier primarily because the contractor or distributor/supplier offered the instant incentive.

Satisfaction and Areas for Improvement

Respondents reported high levels of satisfaction with the program and its components. As shown in Figure 17, both respondents reported being satisfied with the two components of the program they were asked about and with the program itself. Neither respondent reported encountering any challenges to participating in the program and neither suggested ways to improve the program.

Figure 17. Satisfaction with Program Components



Source: Pacific Power Wattsmart Business Program 2018-2019 SBEI Participant Survey QB4, QB7, QB9.

*Rating scale measured “easy” rather than “satisfied” (n=2).

Partial Participants

The Cadmus team received responses from two partial participants who had initially begun lighting retrofit projects. One worked for a commercial business that employs 11 to 25 people, and the other for a public administration organization that employs more than 500 people. Both respondents said their company uses gas to heat the facility. For water heating, one company uses electricity and one uses gas.

Awareness

One respondent learned about the program through a contractor the company had used, and one learned through previous participation. One respondent was *very likely* and one was *somewhat likely* to request an incentive for a project in the next six months. One respondent said the best way for Pacific Power to keep the organization informed about incentives for energy efficiency improvements was through utility mailings, emails, newsletters with bills, or bill inserts. The other respondent said the best way was through contact with a Wattsmart Business representative or utility representative.

Motivation and Barriers

One respondent reported that the company’s most important motivating factor when making decisions about energy efficiency upgrades was saving money on energy bills. The other respondent said it was to improve productivity.

Neither respondent reported that the company completed the initiated project, and both said there were time constraints. One respondent said the company was shorthanded. The other the company was not able to get an electrical contractor out in time to assist with the project.

Satisfaction

Of the two respondents, one reported being *somewhat satisfied* with the program overall, and said there was nothing Pacific Power should do to improve the program experience. The other did not respond to these questions.

Nonparticipants

The Cadmus team conducted a survey with 200 nonparticipants who either had never completed a project through the program or had not completed a project through the program in 2018 or 2019. Over half of nonparticipants operated in the commercial sector (56%, n=192). Most companies employed between one and 10 people (62%, n=190). Nonparticipants tended to be smaller than participants – across the Typical Upgrades, Custom Incentives, and SBEI offerings, 42% of participants had 10 employees or fewer.¹²

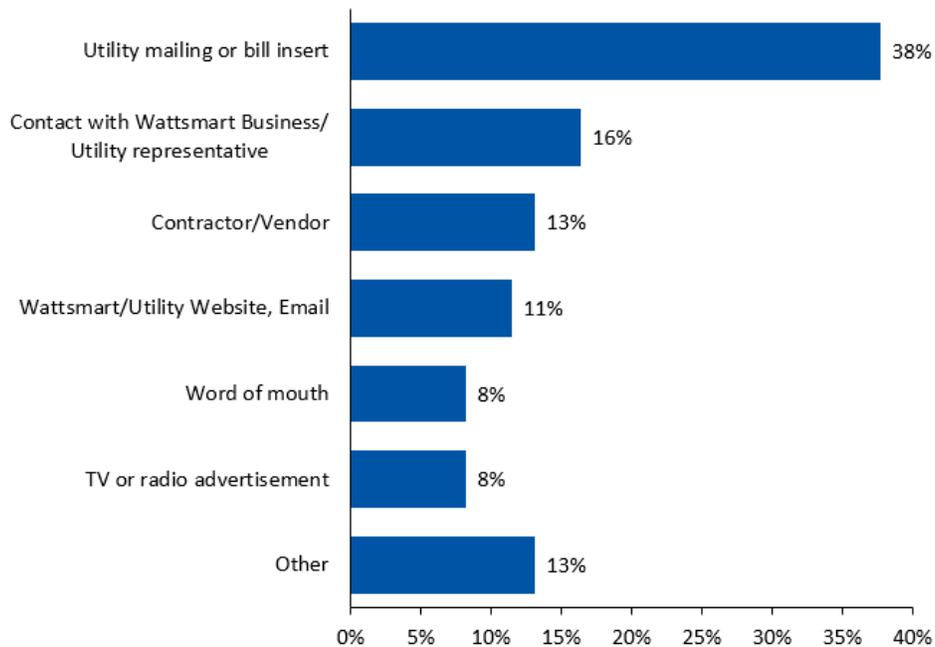
Forty-nine percent of nonparticipants used electricity to heat their facilities, 38% used gas, and 12% used a mixture of both or other fuels (n=178). Nonparticipants relied more heavily on electricity for water heating (67%), with 30% using gas and 4% using a mixture of both or other fuels or not heating water (n=171).

Awareness and Communication

When asked if they had heard of the incentives and technical assistance available through Pacific Power prior to the survey call, 60% of nonparticipant respondents said they had not (n=197). (This is similar to the finding from the 2016-2017 evaluation that 57% of nonparticipant respondents were unaware of Wattsmart Business program incentives and services.) Of the 40% who had heard of the program, they most frequently learned about it through a Pacific Power mailing or bill insert (38%) or through contact with a Wattsmart Business or Pacific Power representative (16%, n=61). Figure 18 shows how nonparticipants heard about the program.

¹² Forty-two percent represents an average, weighted by total program participation, across Typical Upgrades, Custom Incentives, and SBEI. Cadmus did not include the Midstream offering because the survey sample was too small – only 1 respondent of 47 total participants answered the survey and responded to this question.

Figure 18. How Nonparticipants Learned About the Wattsmart Business Program



Source: Pacific Power Wattsmart Business Program 2018-2019 Partial Participant/Nonparticipant Survey: QC3. Multiple responses possible. Don't know and refused responses removed. (n=61)

Motivation

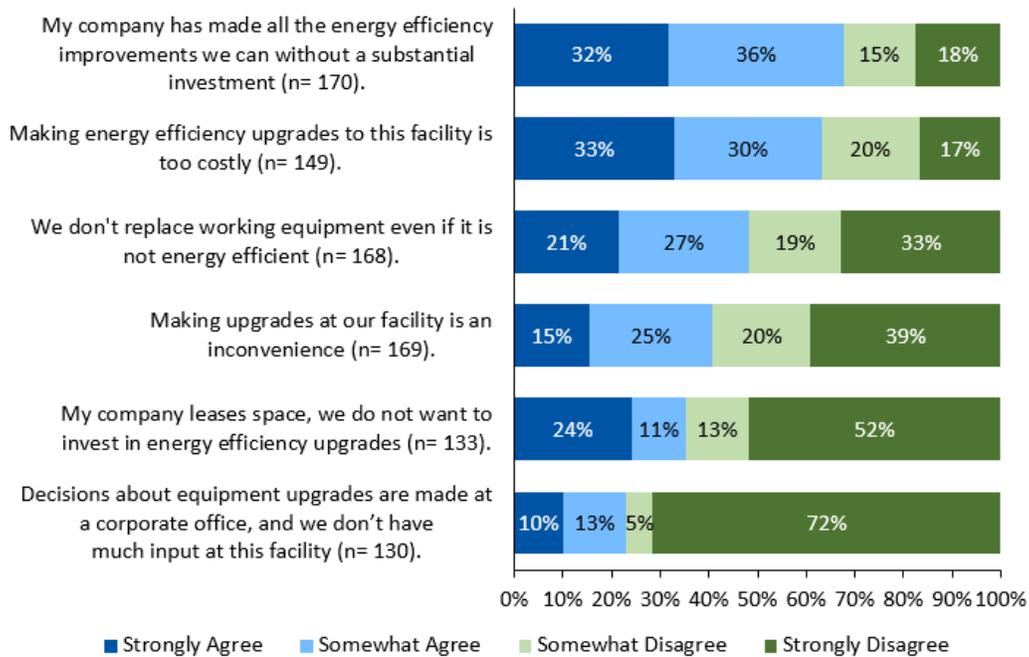
More than any other reason given, nonparticipant respondents said, when considering energy efficiency upgrades, they were primarily motivated by the opportunity to save money on energy bills (76%, n=173). Other responses described a variety of motivations (e.g., environmental concerns, upgrading old equipment, or improving productivity), none of which represented more than 6% of all responses.

Nonparticipant respondents said they would be more motivated to make energy efficiency purchases or upgrades if equipment costs were lower (58%), incentives were higher (25%), or if they had more information on return on investment and/or help with the business case for investment (9%, n=161). Other responses included having more information generally, being offered incentives on different equipment, obtaining higher annual savings, owning the property, and having more money to make such investments.

The survey also asked nonparticipants: “When calculating the return on investment for proposed capital upgrades, does your company include savings gained from energy efficiency?” Fifty-nine percent of respondents said yes (n=182).

To explore nonparticipants’ attitudes about making energy efficiency upgrades at their facilities, the survey asked to what extent respondents agreed with the barrier statements shown in Figure 19. Statements are shown in order by percentage of respondent agreement.

Figure 19. Nonparticipants' Attitudes About Energy Efficiency Improvements



Source: Pacific Power Wattsmart Business Program 2018-2019 Partial Participant/Nonparticipant Survey: QD7a-QD7f.
 Not applicable, don't know, and refused responses were removed.

Responses strongly indicate that nonparticipants view energy efficiency as not worth the required upfront investment. In general, respondents said they had input into decisions about energy efficiency upgrades (77% *somewhat disagreed* or *strongly disagreed* with the statement that they did not, n=130), and most were not opposed to investing in upgrades even in leased spaces (65%, n=133). However, 68% *strongly agreed* or *somewhat agreed* that their company had made all the energy improvements they could without substantial investment (n=170), and 63% agreed that energy efficiency upgrades were too costly (n=149).

Cost-Effectiveness

In assessing the Wattsmart Business program's cost-effectiveness, the Cadmus team analyzed program benefits and costs from five different perspectives, using Cadmus' DSM Portfolio Pro model.¹³ The California Standard Practice Manual for assessing DSM program cost-effectiveness describes benefit/cost ratios for the following five tests:

- **PacifiCorp Total Resource Cost (PTRC) Test:** This test examines program benefits and costs from Pacific Power and Pacific Power's customers' perspectives (combined). On the benefit side, it includes avoided energy costs, capacity costs, and line losses, plus a 10% adder to reflect non-quantified benefits. On the cost side, it includes costs incurred by both the utility and participants.
- **Total Resource Cost (TRC) Test:** This test also examines program benefits and costs from Pacific Power and Pacific Power's customers' perspectives (combined). On the benefit side, it includes avoided energy costs, capacity costs, and line losses. On the cost side, it includes costs incurred by both the utility and participants.
- **Utility Cost Test (UCT):** This test examines program benefits and costs solely from Pacific Power's perspective. The benefits include avoided energy, capacity costs, and line losses. Costs include program administration, implementation, and incentive costs associated with program funding.
- **Ratepayer Impact Measure (RIM) Test:** All ratepayers (participants and nonparticipants) may experience rate increases designed to recover lost revenues. The benefits include avoided energy costs, capacity costs, and line losses. Costs include all Pacific Power program costs and lost revenues.
- **Participant Cost Test (PCT):** From this perspective, program benefits include bill reductions and incentives received. Costs include the measure incremental cost (compared to the baseline measures), plus installation costs incurred by the customer.

Table 20 summarizes the five tests' components.

¹³ DSM Portfolio Pro has been independently reviewed by various utilities, their consultants, and several regulatory bodies, including the Iowa Utility Board, the Public Service Commission of New York, the Colorado Public Utilities Commission, and the Nevada Public Utilities Commission.

Table 20. Benefits and Costs Included in Various Cost-Effectiveness Tests

Test	Benefits	Costs
PTRC	Present value of avoided energy and capacity costs, ^a with a 10% adder for non-quantified benefits	Program administrative and marketing costs, and costs incurred by participants
TRC	Present value of avoided energy and capacity costs ^a	Program administrative and marketing costs, and costs incurred by participants
UCT	Present value of avoided energy and capacity costs ^a	Program administrative, marketing, and incentive costs
RIM	Present value of avoided energy and capacity costs ^a	Program administrative, marketing, and incentive costs, plus the present value of lost revenues
PCT	Present value of bill savings and incentives received	Incremental measure and installation costs

^a These tests include avoided line losses.

Table 21 provides selected cost analysis inputs for each year, including evaluated energy savings, discount rates, line losses, inflation rates, and total program costs. Pacific Power provided all of these values courtesy of Guidehouse except for energy savings.

Table 21. Selected Cost Analysis Inputs

Input Description	2018	2019	Total
Evaluated Energy Savings (kWh/year) ^a	30,893,488	20,535,526	51,429,015
Discount Rate	6.657%	6.657%	N/A
Commercial Line Loss	9.53%	9.53%	N/A
Industrial Line Loss	8.16%	8.16%	N/A
Irrigation Line Loss	9.67%	9.67%	N/A
Inflation Rate	2.2%	2.2%	N/A
Total Program Costs	\$6,082,393	\$4,453,677	\$10,536,070

^a Savings are realized at the meter, while benefits account for line loss.

Table 22 presents the 2018 and 2019 program years’ cost-effectiveness analysis results, not accounting for non-energy benefits (except those represented by the 10% conservation adder included in the PTRC test). For this scenario, the Wattsmart Business program proved cost-effective from the UCT and PCT perspectives. The primary criterion for assessing cost-effectiveness in Washington is the PTRC, which achieved a 1.32 B/C ratio for the combined years’ evaluated savings.

Table 22. Wattsmart Business Program Cost-Effectiveness Summary of 2018 and 2019 Evaluated Savings^a

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/ Cost Ratio
PTRC	\$0.0359	\$16,946,776	\$22,385,981	\$5,439,205	1.32
TRC	\$0.0359	\$16,946,776	\$20,350,892	\$3,404,116	1.20
UCT	\$0.0223	\$10,536,070	\$20,350,892	\$9,814,822	1.93
RIM		\$50,212,489	\$20,350,892	(\$29,861,597)	0.41
PCT		\$11,659,219	\$44,924,933	\$33,265,714	3.85
Lifecycle Revenue Impacts (\$/kWh)					\$0.000728761
Discounted Participant Payback (years)					1.54

^a The cost-effectiveness calculations assume a net to gross of 1.0.

The RIM test measures program impacts on customer rates. Most programs do not pass the RIM test because, while energy efficiency programs reduce costs, they also reduce energy sales. As a result, the average rate per unit of energy may increase. Passing a RIM test indicates that rates, as well as costs, decrease due to the program. Typically, this only happens for demand response programs or programs targeting the highest marginal cost hours (when marginal costs are greater than rates).

Table 23 presents the 2018 program cost-effectiveness analysis results, not accounting for non-energy benefits (except those represented by the 10% conservation adder included in the PTRC test). For this scenario, the Wattsmart Business program proved cost-effective from all test perspectives except the RIM test.

Table 23. Wattsmart Business Program Cost-Effectiveness Summary of 2018 Evaluated Savings

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/ Cost Ratio
PTRC	\$0.0333	\$10,167,384	\$14,350,117	\$4,182,733	1.41
TRC	\$0.0333	\$10,167,384	\$13,045,561	\$2,878,177	1.28
UCT	\$0.0199	\$6,082,392	\$13,045,561	\$6,963,169	2.14
RIM		\$32,034,665	\$13,045,561	(\$18,989,104)	0.41
PCT		\$7,313,092	\$29,180,375	\$21,867,283	3.99
Lifecycle Revenue Impacts (\$/kWh)					\$0.000420798
Discounted Participant Payback (years)					1.60

Table 24 presents the 2019 program cost-effectiveness analysis results, not accounting for non-energy benefits (except those represented by the 10% conservation adder included in the PTRC test). Like in 2018, the Wattsmart Business program proved cost-effective from all test perspectives except the RIM test in 2019.

Table 24. Wattsmart Business Program Cost-Effectiveness Summary of 2019 Evaluated Savings

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC	\$0.0392	\$6,779,392	\$8,035,864	\$1,256,472	1.19
TRC	\$0.0392	\$6,779,392	\$7,305,331	\$525,939	1.08
UCT	\$0.0258	\$4,453,678	\$7,305,331	\$2,851,653	1.64
RIM		\$18,177,824	\$7,305,331	(\$10,872,493)	0.40
PCT		\$4,346,127	\$15,744,558	\$11,398,431	3.62
Lifecycle Revenue Impacts (\$/kWh)					\$0.000295174
Discounted Participant Payback (years)					1.45

Conclusions and Recommendations

Pacific Power, in collaboration with its administrators, Cascade Energy and Nexant, is successfully delivering energy efficiency incentives and services to its customers, as designed in the Wattsmart Business program. Overall, customers reported high satisfaction levels with the program and its elements.

Although the number of projects and reported savings were lower overall in 2019 relative to 2018, the total projects and reported savings for the bi-annual period was like the 2016-2017 period. Over the period, the Small Business Enhanced Incentive offering was a notable standout, with total savings increasing over 150% from 2018 to 2019, corresponding to the time frame of the post card marketing initiative.

Trade allies reported overall satisfaction with the program. They observed that enhanced online tools, and training on incentives for specific measures, such as motors, would be helpful. Participants also continued to report high levels of satisfaction with all aspects of the program.

The 2018 and 2019 program evaluation yielded an overall realization rate of 98.9%, with a precision of $\pm 1.0\%$ at 90% confidence. Realization rates and precision varied to some degree within each of the seven measure categories.

Five strata—lighting, refrigeration, energy management, compressed air, and irrigation—accounted for 95% of reported energy savings. Lighting projects exhibited few discrepancies in realization rates. Generally, the small business lighting and lighting retrofit measures exhibited little variability, while evaluated savings for midstream lighting measures varied substantially from reported savings due to the inherent nature of applying deemed savings values to lighting measures.

In total, evaluated savings for midstream lighting measures tracked well to reported savings, but variability existed among sampled projects. Energy management and refrigeration measures performed well due to the custom nature of projects implemented, effective use of trend data to determine load profiles, and comprehensive project-specific calculation tools implemented when calculating energy savings.

Unlike prior years, compressed air measures realized lower energy savings due to discrepancies discovered by Cadmus related to air compressor run hours, compressor specifications, and system load profiles.

Irrigation and HVAC measures exhibited the greatest variability in realization rates due the application of deemed savings values to measures where the evaluation team applied project specific inputs (such as weather, location, equipment specifications, and load profiles) when calculating savings.

This following section provides the Cadmus team's conclusions and recommendations, based on findings presented in this report.

Savings Considerations

Conclusion—Midstream Lighting Per-Unit Savings Values

Pacific Power reported electric energy savings for midstream lighting projects as a deemed saving value by bulb type and lumen output. The deemed savings value includes a variety of assumed inputs including Waste Heat factor (WHF), HOU, and baseline wattage. Cadmus evaluated these projects based on the RTF’s Non-Residential Lighting Midstream measure and found the evaluated savings deviated from reported for several sampled projects. Among the 4 evaluated projects, the average realization rate was 78%. The RTF’s Non-Residential Lighting Midstream measure was first approved on November 16, 2017 and has undergone seven revisions since that time. The latest version (Non-Residential Lighting Midstream v4.1) was approved on December 16, 2020 and utilizes the most recent data and information available to determine lighting savings through a midstream energy efficiency program.

Recommendation

Cadmus recommends Pacific Power adopt the deemed savings values by bulb type and lumen output from the RTF’s Non-Residential Lighting Midstream.

Participant Experience

Conclusion

Pacific Power’s Typical Upgrades and Custom Analysis offers continue to provide a broadly satisfactory experience for customers in most aspects. Ease of paperwork was the program component with the lowest number of satisfied participants, at 87%, but this result nevertheless shows that the great majority of participants found that the application paperwork was easy.

Recommendation

Continue to monitor the program administrative systems for potential improvements, such as the ongoing effort to develop an online application portal for participants. Online applications are a best practice for nonresidential incentive programs because they reduce the perceived paperwork burden for participants by auto-populating some fields, keep all project documents in a single location, and allow customers to reference the status of their application as it is being processed.

Conclusion

Overall, the Small Business Enhanced Incentive program provides a positive experience for customers and trade allies, and the lead generation campaign has been successful in increasing participation. Trade allies reported the leads lend their company credibility and help them close deals. In addition, participation data shows an increase in unique customers and total projects, and a more than 100% increase in reported savings for the Small Business enhanced Incentive program between 2018 and 2019, despite decreases in total savings for both Lighting Instant Incentives and Typical Upgrades lighting projects.

Recommendation

Leverage the successes of companies that have been able to grow their sales volume or expand their sales territory using the program in order to encourage more of the 40 registered trade allies to actively participate in the program. If not already available, Nexant should develop case studies of specific installers active in the small business program who can demonstrate measurable benefits as a result of their participation. In addition, Nexant should continue to develop and grow the lead generation campaign in order to increase participation in the Small Business Enhanced Incentive program further. If possible, Nexant should establish criteria for installers to be eligible for this initiative, and promote it as a potential benefit for engaged participating installers. Nonparticipants

Conclusion

Evidence from nonparticipant surveys indicates that existing delivery channels and marketing strategies may be insufficient to penetrate the majority of Pacific Power's nonresidential customer base. Sixty percent of nonparticipant respondents were not familiar with the Wattsmart Business incentives (similar to the result from the 2016-2017 survey, in which 57% of respondents were not familiar with Wattsmart offerings). Survey responses suggest that small businesses (10 employees or fewer) are particularly underrepresented in the Wattsmart programs, since small businesses made up 62% of the nonparticipant responses, but just 42% of the participant responses.

Recommendation

Nexant should continue to focus on ways to expand the Small Business Enhanced Incentive offering, since this offering is designed to target small businesses. Increasing activity among trade allies, as suggested above, should also drive increased participation by small businesses as well as customers overall. In addition, small businesses often experience greater technical, financial and administrative burdens than larger businesses. If it is not doing so already, Pacific Power should collect data from their financing partner, National Energy Improvement Fund, on applications received and applications funded. Ideally, this information could be incorporated into the DSMC database. If small businesses are not using this resource as often as larger firms, additional outreach may be helpful to let small businesses know the resource is available. If small businesses are not being approved as often as large businesses, Pacific Power may want to consider alternative financing support.

Appendices

Appendix A. Participant Survey Guides

Appendix B. Nonparticipant Survey Guide

Appendix C. Measure Category Cost-Effectiveness

Appendix A. PacifiCorp Wattsmart Business Program 2018 - 2019 Wattsmart Business Participant Survey

Researchable Questions		
Key Research Topics	Areas of Investigation	Related Questions
Screening	Project initiation process	B1
Marketing and Outreach	Program Awareness	A4, A5
Barriers	Obstacles to installing high-efficiency equipment	B2, B13, B17, B18
Satisfaction	Assess satisfaction with Program application process, various program components and reasons for dissatisfaction among participants	B4-B13, B15, B16
Firmographics	Determine building and company characteristics of participants	Section E
Decision Making	Key factors influencing customers' decision to participate in program	B1, B14
Freeridership and Spillover	Assess net savings	Sections C and D

Target Quota = TBD

General Instructions

- This survey is designed for visual presentation online
- Text in red indicates programming instructions that will not be seen by the respondent
- Question numbers will not be seen by the respondent

Variables to be pulled into Survey

- **[PROGRAM NAME]**
- **[UTILITY]**
- **[MEASURE1]**
- **[LTG FLAG]** (indicates a participant that purchased LEDs, but did not purchase controls)
- **[PROGRAM YEAR]**
- **[CONTACT NAME]**
- **[CUSTOMER NAME]**
- **[SITE ADDRESS 1]**
- **[SITE CITY]**
- **[SITE ZIP]**
- **[PROJECT STATE]**
- **[CUSTOMER INCENTIVE]**
- **[BILL_CREDIT]**

Email Invitation

To: [EMAIL]

From: **UTILITY** Feedback

Subject: We're checking in...give us an update on your efficient equipment purchase with a **[UTILITY] Wattsmart Business** rebate

Dear **[CONTACT NAME]**,

We invite you to tell us about your recent experience with **UTILITY's [PROGRAM NAME]** program. Your input is very important to us and will be kept confidential and only used for research purposes. The survey will take 7-10 minutes to complete. As our thanks for completing the survey, eligible respondents will be **entered into a drawing to win one of five \$50 Amazon gift cards**. Your vital feedback will be used to improve our programs for customers like you.

Click the link below to find out if you are eligible:

[auto-generated link]

Or you may copy and paste the URL below into your internet browser: [auto-generated URL]

If you have any questions about this research, or any difficulties taking the survey, please contact Alex Opipari at The Cadmus Group, the national research firm conducting this survey on **[UTILITY'S]** behalf. You can reach Alex at alex.opipari@cadmusgroup.com.

Thank you in advance for sharing your experiences and your time.

Alesha Pino
Sr. Business Specialist
PacifiCorp

Reminder Invitation

To: [EMAIL]

From: **UTILITY** Feedback

Subject: Don't forget to tell **UTILITY** about your **[PROGRAM NAME]** program experience!

Dear **[CONTACT NAME]**,

We recently invited you to tell us about your experience with **UTILITY's [PROGRAM NAME]** program. We would still like to hear from you. Your input is very important to us and will be kept confidential. **Please take 7-10 minutes today to complete the survey.** As our thanks for completing the survey, eligible respondents will be entered into a drawing to win one of five \$50 Amazon gift cards. Your vital feedback will be used to improve our programs for customers like you.

Click the link below to find out if you are eligible:

[auto-generated link]

Or you may copy and paste the URL below into your internet browser: [auto-generated URL]

If you have any questions about this research, or any difficulties taking the survey, please contact Alex Opipari at The Cadmus Group, the national research firm conducting this survey on **[UTILITY'S]** behalf. You can reach Alex at alex.opipari@cadmusgroup.com.

Thank you in advance for sharing your experiences and your time.

Alesha Pino
Sr. Business Specialist
PacifiCorp

Email Invitation – for suggested contacts

To: **[EMAIL]**

From: **UTILITY** Feedback

Subject: We're checking in...give us an update on your efficient equipment purchase with a **[UTILITY] Wattsmart Business** rebate

Dear **[CONTACT NAME]**,

We are reaching out to you based on a referral from **[NAME OF REFERRER]**. We invite you to tell us about your recent experience with **UTILITY's [PROGRAM NAME]** program. Your input is very important to us and will be kept confidential and only used for research purposes. The survey will take 7-10 minutes to complete. As our thanks for completing the survey, eligible respondents will be **entered into a drawing to win one of five \$50 Amazon gift cards**. Your vital feedback will be used to improve our programs for customers like you.

Click the link below to find out if you are eligible:

[auto-generated link]

Or you may copy and paste the URL below into your internet browser: [auto-generated URL]

If you have any questions about this research, or any difficulties taking the survey, please contact Alex Opipari at The Cadmus Group, the national research firm conducting this survey on **[UTILITY'S]** behalf. You can reach Alex at alex.opipari@cadmusgroup.com.

Thank you in advance for sharing your experiences and your time.

Alesha Pino
Sr. Business Specialist
PacifiCorp

Survey Introduction and Screener

[UTILITY-APPROVED LOGO TO APPEAR ON START SCREEN]

Welcome! Thank you for sharing your experience with the [PROGRAM NAME] program, offered by UTILITY.

[TERMINATION MESSAGE] Based on your responses, you are not eligible for this survey. Thank you for your interest in the WattsMart Business program.

[UTILITY] offers a variety of energy efficiency programs that could help you save energy and manage your monthly bills. For more information on other ways to save, please visit [UTILITY].net.

A. Screeners

A1. Before beginning, please verify our program information is correct and you are familiar with the project.

Our records show that you installed energy efficient equipment including [MEASURE1], at [SITE ADDRESS 1] in [INSERT PROGRAM YEAR]? Is this correct? [MULTIPLE RESPONSE]

1. Yes

2. No, wrong year

A1a. In what year did you install this project? [RECORD CORRECT YEAR : _____]

3. No, wrong address

A1b. What is the correct address? [RECORD CORRECT ADDRESS: fields for street, city, state, zip]

4. No, wrong measure

A1c. What type of equipment did you install or adjust? [CALL THIS VARIABLE C_MEASURE]

1. Lighting

2. New HVAC equipment

3. HVAC equipment scheduling or setpoint changes

4. Ventilation, Motor or Fan

5. Refrigeration

6. Compressed air

7. Irrigation

8. Other equipment

A1d. Can you describe this equipment? [OPEN_ENDED: _____]

5. No, I did not participate [THANK AND TERMINATE]

98. I don't know

A1e. Can you provide the name and email address of the right person to speak to about this project?

1. [First Name] [Last Name] [Email address]
[THANK AND TERMINATE]

A2. To ensure our records are correct, can you confirm that you received an incentive for this upgrade? The incentive may have been in the form of a check from the utility, a utility bill credit, or a discount applied to your project or equipment invoice.

1. Yes, I received an incentive

2. No, I did not receive an incentive [THANK AND TERMINATE]

98. I don't know

A2f. Can you provide the name and email address of the right person to speak to about this project?

1. [First Name] [Last Name] [Email address]
[THANK AND TERMINATE]

A3. Great, you are eligible to take this short survey and be entered to win one of five \$50 Amazon gift cards!

This survey will take 7-10 minutes to complete. Your responses will remain confidential and will only be used for research purposes. Be sure to enter your name and address at the end of the survey to enter the drawing.

A4. How did your organization learn about the incentives or discounts available for this project? Please select all that apply and scroll down to see all options. [RANDOMIZE LIST]

1. Contact with Wattsmart Business representative or utility representative

2. Wattsmart Business printed program materials

3. [UTILITY] Website

4. Wattsmart Business sponsored workshop or community event

5. [UTILITY] mailing or bill insert

6. [UTILITY] email

7. Through my electrician or contractor

8. Previously participated and received a [UTILITY] incentive

9. Through a civic organization, trade association or professional organization [SPECIFY:

_____]

10. Through the distributor or supplier where I purchase equipment

11. Word of mouth, family, friend, or business colleague

12. TV or radio advertisement

- 13. Social media or other online advertisement
- 14. Other [SPECIFY: _____]
- 98. I don't know

- A5. **[IF A4≠8]** To your knowledge, had your company participated in a **[UTILITY]** incentive program prior to completing this project?
- 1. Yes
 - 2. No
 - 3. I don't know

B. **Wattsmart Business**

Thank you. This next section will ask you about the process to apply for and receive your incentive.

- B1. Who took the lead role in completing the application paperwork, including any supplemental applications? **[RANDOMIZE LIST; MAINTAIN "OTHER" AND "DON'T KNOW" AT END]**
- 1. Myself or someone else at my company
 - 2. My contractor or installer
 - 3. A Wattsmart Business representative or Energy Engineer
 - 4. My **[UTILITY]** account representative
 - 5. Someone else: [_____]
 - 6. I don't know
- B2. How easy would you say this paperwork was to complete?
- 1. Very easy
 - 2. Somewhat easy
 - 3. Not too easy
 - 4. Not at all easy
 - 98. I was not involved in the paperwork at all

[ASK IF B2=2, 3 OR 4]

- B3. What would have made this paperwork easier to complete?
- 1. [_____]
 - 98. I don't know
- B4. Thinking about the incentive you received for this project, how satisfied were you with the dollar amount of the incentive?
- 1. Very satisfied
 - 2. Somewhat satisfied
 - 3. Not too satisfied

4. Not satisfied at all

98. I don't know the amount of the incentive [SKIP TO B6]

B5. About what percent of the project cost would you estimate was covered by the incentive?

1. [NUMERIC: 0% to 100%] % of the total project cost

98. I don't know

B6. [IF B4=2, 3 OR 4 OR 98] What incentive amount would have been enough for you to say you were very satisfied? Please respond as a percent of the total project cost.

1. [NUMERIC: 0% to 100%] % of the total project cost

98. I don't know

B7. How satisfied were you with the number of weeks from when you submitted a final application to when you received your incentive?

1. Very satisfied

2. Somewhat satisfied

3. Not too satisfied

4. Not satisfied at all

98. I don't know

B8. [IF B7=2, 3 OR 4] How many weeks would be acceptable from when you submit your application to when you receive your incentive?

1. [_Numeric 0-20_] weeks

98. I don't know

Screen Text: Thank you, the next questions will ask you about the implementation of your project.

B9. Who, if anyone, was involved in helping you install the [INSERT MEASURE1 OR C_MEASURE1].

1. A Wattsmart Business program participating vendor

2. My independent contractor [SKIP TO B12]

3. Someone else [SPECIFY: _____] [SKIP TO B12]

98. I don't know [SKIP TO B12]

B10. How satisfied were you with the work provided by the participating vendor that installed the [INSERT MEASURE1 OR C_MEASURE1]?

1. Very satisfied

2. Somewhat satisfied

3. Not too satisfied

4. Not satisfied at all

98. I don't know

B11. **[IF B10=2, 3 or 4]** Why do you say that?

1. **[TEXT: _____]**
98. I don't know

B12. How satisfied are you with the **[MEASURE1 OR C MEASURE1]** you installed?

1. Very satisfied
2. Somewhat satisfied
3. Not too satisfied
4. Not satisfied at all
98. I don't know

B13. **[IF B12=2, 3 or 4]** Why do you say that?

1. **[TEXT: _____]**
98. I don't know

B14. What would you say are the main benefits your company has experienced as a result of the energy-efficient equipment you installed? **Select all that apply. [RANDOMIZE]**

1. Using less energy, reducing energy consumption or energy demand
2. Saving money on our utility bills; lower energy bills
3. Increased occupant comfort
4. Better aesthetics/better or brighter lighting
5. Increased productivity
6. Saving money on maintenance costs
7. Improved equipment function
8. Another benefit: **[_____]**
9. NO BENEFITS **[LOCK OUT OTHER RESPONSES IF SELECTED]**

B15. Thinking about your project overall, how satisfied are you with the Wattsmart Business program?

1. Very satisfied
2. Somewhat satisfied
3. Not too satisfied
4. Not satisfied at all

[IF B15=2, 3, OR 4]

B16. Why do you say you were **[INSERT ANSWER FROM B15]** with the Wattsmart Business program?

1. **[SPECIFY: _____]**
98. I don't know

- B17. **[IF LTG FLAG=YES]** In the process of scoping your project, did you consider installing lighting controls?
1. Yes
 2. No
- B18. **[IF LTG FLAG=YES]** Why did you not purchase controls for your lighting equipment?
1. Our company has no need to automate lighting
 2. Controls are too expensive
 3. Didn't know enough about the technology or the options
 4. We already have controls installed
 5. We did purchase controls
 6. Another reason: _____
- B19. Do you have any recommendations to improve the Wattsmart Business program?
- 1.No
 - 2.Yes **[OPEN END TEXT ENTRY]**

C. *Freeridership*

[ASK SECTION C IF PROJECT STATE = WA, UT,WY OR ID; AND IF [PROGRAM YEAR] = 2019] [FORCE RESPONSE TO ALL QUESTIONS]

Thank you. For the next questions, think about the process to identify your project and finalize your decision to purchase the **MEASURE1/C_MEASURE1.**

- C1. Without the program, meaning without either the technical assistance or the financial incentive, would you have still completed the **exact same [MEASURE_1/C_MEASURE1] project?**
1. Yes
 2. No **[SKIP TO C3]**
 98. I don't know **[SKIP TO C3]**
- C2. Without the program, meaning without either the technical assistance or the financial incentive, would you have still installed the **[MEASURE_1/C_MEASURE1]** at the same time?
1. Yes **[SKIP TO C7]**
 2. No **[SKIP TO C4]**
 98. I don't know **[SKIP TO C4]**
- C3. Without the program, would you have installed **any [MEASURE_1/C_MEASURE1]?**
1. Yes
 2. No **[SKIP TO C8]**
 98. I don't know **[SKIP TO C8]**

- C4. Without the program, in terms of timing, when would you have installed the **[MEASURE_1/C_MEASURE1]**?
1. Within one year from original participation date
 2. In one to two years from original participation date
 3. More than two years from original participation date **[SKIP TO C8]**
 98. I don't know
- C5. Relative to the energy efficiency of **[MEASURE_1/C_MEASURE1]** installed through the program, how would you characterize the efficiency of equipment you would have installed **without** the program?
1. Just as efficient as installed with the program
 2. Lower than installed through the program, but better than standard efficiency
 3. Standard efficiency
 98. I don't know
- C6. Would you have installed more, less, or the same amount of **[MEASURE_1/C_MEASURE1]** without the program?
1. More
 - C6a. Compared to the installed amount, how much more?
[RECORD PERCENTAGE: _____]
 2. Less
 - C6b. Compared to the installed amount, how much less?
[RECORD PERCENTAGE: _____]
 3. Same amount
 98. I don't know
- C7. Prior to hearing about the program, was the cost of **[MEASURE_1/C_MEASURE1]** included in your organization's most recent capital budget?
1. Yes
 2. No
 98. I don't know
- C8. In your own words, can you please describe what impact the program had on your decision to complete these energy efficiency improvements for **[MEASURE_1/C_MEASURE1]**?
- C9. With the Wattsmart Business program, your company received financial incentives of **[CUSTOMER INCENTIVE]** for installing **[MEASURE_1/C_MEASURE1]**.

For the **[MEASURE_1/C_MEASURE1]** purchase, on a scale from 1 to 5, with 1 being not important at all and 5 being extremely important, how important was each of the following factors in deciding which equipment to install. If a factor is not applicable to you, please say so. **[NOTE: Respondent fills in numeric value (1 to 5) for each of the below six items. Respondents can also state that a particular factor is Not Applicable, please code N/A as 99]**

1. Recommendation from contractor or vendor
2. Information provided by [UTILITY] on energy saving opportunities
3. Information on payback
4. The [UTILITY] incentive or discount
5. Familiarity with this equipment
6. Previous participation with a [UTILITY] program

D. Spillover

[ASK SECTION D IF PROJECT STATE = WA, UT, WY OR ID]

The next questions will ask about energy efficiency improvements *other than those* you installed through the program.

- D1. Since participating in this program, have you purchased and installed any additional energy efficiency improvements on your own without any financial assistance from a utility?
1. Yes
 2. No [SKIP TO SECTION E]
 98. I don't know [SKIP TO SECTION E]
- D2. Did you purchase and install any energy efficient improvements that are the **same type** as the [MEASURE_1/C_MEASURE1] you installed through the program?
1. Yes
 2. No [SKIP TO D8]
 98. I don't know [SKIP TO D8]
- D3. How many did you purchase and install?
1. [RECORD RESPONSE]
 98. I don't know
- D4. Relative to the energy efficiency of the equipment installed through the program, how would you characterize the efficiency of this equipment?
1. Just as efficient as installed through the program
 2. Lower than installed through the program, but better than the standard efficiency
 3. Standard efficiency
 98. I don't know
- D5. Did you receive an incentive from [UTILITY] or another organization for this equipment?
1. Yes
 2. No
 98. I don't know

[ASK IF D5=1]

D6. On a scale from 1 to 5, with 1 being not important at all and 5 being extremely important, please rate how important your experience with the [UTILITY] Wattsmart Business program was in your decision to install these energy efficient products.

1. [RECORD RATING: _____]
98. I don't know

[ASK IF D5=2]

D7. Why did you not apply for an incentive from [UTILITY] for this equipment?

1. [RECORD RESPONSE]
98. I don't know

[ASK ALL]

D8. Since participating in the [PROGRAM NAME] program, did you purchase and install any *other* energy efficiency improvements on your own without any financial or technical assistance from a utility, vendor or other organization?

1. Yes
2. No [SKIP TO SECTION E]
98. I don't know [SKIP TO SECTION E]

D9. What type of equipment did you install? [SELECT ALL THAT APPLY]

1. Lighting equipment
2. HVAC equipment
3. Water heating equipment
4. Variable drive
5. Efficient motor
6. Refrigeration equipment or freezers
7. Building envelope measure
8. Compressed air equipment
9. Chiller
10. Pump
11. Irrigation equipment (gaskets, drains, sprinklers, etc.)
12. Other equipment: [SPECIFY] _____
13. None of the above [SKIP TO SECTION E]
98. I don't know [SKIP TO SECTION E]

[ASK D10.11-D10.14 AND D10-D14 if D9=1]

D10.11 What type of lighting was purchased and installed without assistance?

[MULTIPLE RESPONSE]

1. Decorative LEDs
2. LED wall fixtures
3. General purpose LEDs
4. Pin-based LEDs
5. Reflector/flood LEDs
6. Tubular LEDs
7. Exterior LED wall packs or fixtures
8. Other type [_____]

D10.12 What is the wattage of the lighting? **[SPECIFY]:** _____

D10.13 In what location was it installed?

1. Wall
 2. Ceiling
 3. Outdoors
4. Another location **[SPECIFY]:** _____
98. I don't know

D10.14 What type of equipment was removed or replaced? **[SPECIFY]:** _____

[ASK D10.21-D10.24 AND D10-D14 if D10=2]

D10.21 What type of HVAC equipment was purchased and installed without assistance?

[SPECIFY TYPE]: _

D10.22 What Fuel type is used? **[SPECIFY]:** _____

D10.23 What is the efficiency rating of the equipment? This will be the HSPF or SEER or ER rating of the equipment. **[SPECIFY]:** _____

D10.24 What is the capacity of the equipment in tons? **[SPECIFY]:** _____

[ASK D10.31-D10.34 AND D10-D14 if D10=3]

D10.31 What type of water heating equipment was purchased and installed without assistance? (For example: storage tank, tankless, heat pump, point-of-use, etc.) **[SPECIFY TYPE]:** _____

D10.32 What Fuel type is used? **[SPECIFY]:** _____

D10.33 What is the efficiency rating of the equipment? (This should be an energy factor, such as .62 EF, or 2.6 EF) **[SPECIFY]:** _____

D10.34 33 If a water heater with storage, what is the equipment capacity in gallons? **[SPECIFY]:**

[ASK D10.41-D10.42 AND D10-D14 if D10=4]

D10.41 What type of motor was the VFD installed on? **[SPECIFY TYPE]:** _____

D10.42 What is the horsepower of the motor? **[SPECIFY]:** _____

[ASK D10.51-D10.52 AND D10-D14 if D10=5]

D10.51 What equipment was the motor installed on? **[SPECIFY TYPE]:** _____

D10.52 What is the horsepower of the motor? **[SPECIFY]:** _____

[ASK D10.61 AND D10-D14 if D10=6]

D10.61 What type of refrigeration or freezer equipment did you install without assistance? **[SPECIFY TYPE]:** _____

[ASK D10.71-D10.72 AND D10-D14 if D10=7]

D10.71 What is the efficiency R-value of the insulation measure? **[SPECIFY]:** _____

D10.72 In what location was it installed Wall/Roof/Floor? **[SPECIFY]:** _____

[ASK D10.81-D10.82 AND D10-D14 if D10=8]

D10.81 For what type of application was the compressed air equipment purchased and installed (production line, etc.)? **[SPECIFY APPLICATION]:** _____

D10.82 What is the horsepower of the compressor motor? **[SPECIFY]:** _____

[ASK D10.91-D10.92 AND D10-D14 if D10=9]

D10.91 FOR What type of application was the chiller purchased and installed (commercial building, etc.)? **[SPECIFY APPLICATION]:** _____

D10.92 What size chiller did you install? **[SPECIFY]:** _____ (tons)

[ASK D10.101-D10.103 AND D10-D14 if D10=10]

D10.101 FOR What type of application was the pump purchased and installed (HVAC, etc)? **[SPECIFY APPLICATION]:** _____

D10.102 What is the horsepower of the motor for the pump? **[SPECIFY]** _____

D10.103 What is the efficiency rating of the pump? **[SPECIFY]:** _____ (%)

[ASK D10.111 AND D10-D14 if D10=11]

D10.111 What irrigation equipment did you purchase and install without assistance? **[SPECIFY GASKETS, DRAINS, SPRINKLERS, ETC.]:** _____

[ASK IF D9=1-12] [ASK ABOUT EACH ITEM MENTIONED IN D10]

- D10. In regard to the **[D9 TEXT]**, how many did you purchase and install? **[ASK FOR EACH MEASURE MENTIONED IN D10] [IF D10 MEASURE = 'BUILDING ENVELOPE' THEN ASK HOW MANY 'SQUARE FEET']**
1. **[RECORD RESPONSE]**
 98. I don't know

[ASK IF D10=1-12] [ASK ABOUT EACH ITEM MENTIONED IN D10]

- D11. Just to confirm, did you receive an incentive from **[UTILITY]** or another organization for this equipment? **[ASK FOR EACH MEASURE MENTIONED IN D10]**
1. Yes
 2. No
 98. I don't know

[ASK FOR EACH YES IN D11]

- D12. What utility or organization provided the incentive? **[ASK FOR EACH MEASURE MENTIONED IN D10]**
1. **[RECORD UTILITY OR ORGANIZATION]**
 98. I don't know

[ASK IF D10=1-12] [ASK ABOUT EACH ITEM MENTIONED IN D10]

- D13. What information did you rely upon to determine that the equipment installed was energy efficient? **[ASK FOR EACH MEASURE MENTIONED IN D10]**
1. **[RECORD RESPONSE]**
 98. I don't know

[ASK IF D10=1-12] [ASK ABOUT EACH ITEM MENTIONED IN D10]

D14. On a scale from 1 to 5, with 1 being not important at all and 5 being extremely important, please rate how important your experience with the [UTILITY] Wattsmart Business program was in your decision to install [this/these] energy efficient products. [ASK FOR EACH MEASURE MENTIONED IN D10]

1. [RECORD RATING: _____]

98. I don't know

[ASK SECTION E TO ALL SURVEY RESPONDENTS]

E. Firmographics

These final questions will help us understand your business.

- E1. What industry is your company in?
1. Accommodation
 2. Arts, Entertainment and Recreation
 3. Construction
 4. Dairy, Agricultural
 5. Educational Services
 6. Finance, Insurance
 7. Food Service
 8. Food Processing
 9. Health Care
 10. Manufacturing
 11. Mining
 12. Nonprofit and Religious Organizations
 13. Oil and Gas
 14. Professional, Scientific and Technical Services
 15. Public Administration/Government Services
 16. Retail
 17. Refrigerated Warehouse
 18. Real Estate/Property Management
 19. Repair and Maintenance Service
 20. Transportation
 21. Warehouses or Wholesaler
 22. Something else [SPECIFY: _____]
98. I prefer not to answer

E2. How many people are employed by your company at all locations in **[PROJECT STATE]**?

1. None
2. 1-10
3. 11-25
4. 26-50
5. 51-75
6. 76-100
7. 101-200
8. 201-500
9. More than 500
10. I don't know
11. I prefer not to answer

E3. What type of fuel is used for space heating at your facility?

1. Electric
2. Gas
3. Another fuel **[SPECIFY: _____]**
4. I don't know

E4. What type of fuel is used for water heating at your facility?

1. Electric
2. Gas
3. Another fuel **[SPECIFY: _____]**
4. I don't know

F. Closing

F1. **Please provide the following information to be entered into a drawing to win one of five \$50**

Amazon gift cards.

1. Name:
2. Address:
3. Address 2:
4. City:
5. State:
6. Zip:
7. Email:

This completes the survey! Your responses are very important to [UTILITY]. We appreciate your participation and thank you very much for your time. Have a good day.

Appendix B. PacifiCorp Wattsmart Business Program (2018-2019) Nonparticipant/Partial Participant Phone Survey

Researchable Questions		
Key Research Topics	Areas of Investigation	Related Questions
Marketing and Outreach	Program awareness	C1-C4, D10-D11
	Future communication preferences	C5
Motivation and Barriers	Reasons to make energy-efficient improvements; Obstacles to installing high-efficiency equipment	D1-D9, D12-D14, G1-G3
Spillover	Assess savings spillover	Section E
Firmographics	Determine building and company characteristics of participants	Section F

Target Quota:

Nonparticipants: up to 200 for each state

Partial Participants: up to 50 for each state

Partial participants: (See quota tab in Partial Participants 2018-2019 Sample for VuPoint)

General Instructions

- Interviewer instructions are in green **[LIKE THIS]** (the style is “Survey: Interviewer Instructions”).
- CATI programming instructions are in red **[LIKE THIS]** (the style is “Survey: Programming”).
- Items that should not be read by the interviewer are in parentheses like this ().

Variables to Be Pulled into Survey

- **[CONTACT NAME]**
- **[CUSTOMER NAME]**
- **[SITE.ADDRESS 1]**
- **[SITE CITY]**
- **[SITE STATE]**
- **[UTILITY]**
- **[MEASURE.NAME.FINAL] MEASURE**
- **[YEAR] PROGRAM YEAR**

A. Introduction

- A1. Hello, I'm [INSERT NAME] calling on behalf of [UTILITY]. May I speak with [CONTACT NAME]? OR [IF NO NAME OR NAMED RESPONDENT NO LONGER WORKS FOR COMPANY] May I speak with the person who handles energy decisions for your company? [IF THAT PERSON IS NOT AT THIS PHONE NUMBER, ASK FOR THEIR NAME AND PHONE NUMBER AND START AGAIN]
1. (Yes) [IF CORRECT PERSON, SKIP TO A3. IF TRANSFERRED TO SOMEONE ELSE, READ A2]
 2. (No or not a convenient time) [ASK IF RESPONDENT WOULD LIKE TO ARRANGE A MORE CONVENIENT TIME OR IF YOU CAN LEAVE A MESSAGE FOR A MORE APPROPRIATE PERSON]
 98. (Don't know) [ASK TO SPEAK WITH SOMEONE WHO KNOWS AND BEGIN AGAIN]
 99. (Refused) [THANK AND TERMINATE]
- A2. Hello, I'm [INSERT NAME] calling on behalf of [UTILITY]. Are you the person responsible for making energy decisions for your company at the [SITE.ADDRESS 1] location?
1. (Yes)
 2. (No, person is able to come to phone) [ASK FOR PERSON WHO IS AND START AGAIN]
 3. (No, person is not able to come to phone) [GET NAME AND PHONE NUMBER, SCHEDULE CALL BACK]
 98. (Don't know) [ASK TO SPEAK WITH SOMEONE WHO KNOWS AND BEGIN AGAIN]
 99. (Refused) [THANK AND TERMINATE]
- A3. How are you doing today? I'm calling because we are conducting an important survey today about [UTILITY]'s Wattsmart Business Program. [UTILITY] is actively seeking your opinions to help improve their energy efficiency incentive programs and to better understand how to assist customers in saving money and energy. **THIS CALL WILL TAKE ABOUT FIVE MINUTES.** So you are aware, this call may be monitored or recorded for quality assurance purposes. Anything you share with us today will be kept confidential and anonymous. Is that alright?
1. [IF RESPONDENT ASKS HOW LONG, SAY "Approximately 5 minutes."]
 2. [IF NEEDED, STATE "This survey is for research purposes only and is not a marketing call. This is the primary way for customers to provide input into the incentive programs [UTILITY] offers. Your perspectives help [UTILITY] design energy-efficiency programs to help their customers save money and energy."]
 3. [ONLY IF ASKED FOR A [UTILITY] CONTACT TO VERIFY THE SURVEY AUTHENTICITY, OFFER [Alesha Pino, 801-220-2656]

B. Screeners

[ASK PARTIAL PARTICIPANTS]

- B1. Our records show that you initiated **[DEPENDING ON MEASURE NAME READ “a” or “an”]** **[MEASURE]** project at **[SITE.ADDRESS 1]** with **[UTILITY]** in **[YEAR]**, but did not complete this project through the Wattsmart Business Program. Is this correct?
1. (Yes)
 2. (No, wrong year) **[RECORD CORRECT YEAR, IF POSSIBLE]**
 3. (No, wrong address) **[RECORD CORRECT ADDRESS]**
 4. (No, I did not participate) **[THANK AND TERMINATE]**
 98. (Don’t know) **[ASK TO SPEAK WITH SOMEONE WHO WOULD KNOW AND START AGAIN AT A2. IF NO ONE, THEN THANK AND TERMINATE]**
 99. (Refused) **[THANK AND TERMINATE]**

[THANK AND TERMINATE TEXT] Those are all the questions we have for you today. Thank you for your help. Have a nice day!

[ASK EVERYONE]

- B2. Did your company receive an incentive from **[UTILITY]**’s Wattsmart Business Program for installing **[FOR PARTIAL PARTICIPANTS READ: this equipment?]** **[FOR NONPARTICIPANTS READ: energy efficient equipment in 2018 or 2019? By energy-efficient equipment, I mean high-efficiency lighting, HVAC equipment, irrigation or dairy equipment, variable speed drives, building envelope, or other energy-efficient equipment.]**
1. (Yes) **[READ: For this survey, we are seeking those companies who did not receive an incentive. We will not take any more of your time today. Thank you.] [TERMINATE]**
 2. (No)
 98. (Don’t know) **[ASK TO SPEAK WITH SOMEONE WHO WOULD KNOW AND START AGAIN AT A2. IF NO ONE, THEN THANK AND TERMINATE]**
 99. (Refused) **[THANK AND TERMINATE]**

[THANK AND TERMINATE TEXT] Those are all the questions we have for you today. Thank you for your help. Have a nice day!

C. Awareness

[ASK PARTIAL PARTICIPANTS C1 THEN SKIP TO C4]

- C1. Even though you did not receive an incentive; how did your organization learn about the incentives available for this project? **[DO NOT READ LIST; MULTIPLE RESPONSES POSSIBLE]**
1. (Contact with Wattsmart Business representative or utility representative)
 2. (Wattsmart Business printed program materials)
 3. **[(UTILITY) Website]**
 4. (Wattsmart Business sponsored workshop or community event)
 5. **[(UTILITY) mailing or bill insert]**
 6. **[(UTILITY) email]**
 7. (Through my electrician or contractor)
 8. (Previously participated in program/received an incentive)
 9. (Through a trade association or professional organization) **[SPECIFY: _____]**
 10. (Through a vendor, distributor or supplier where I purchase lighting)
 11. (Word of mouth (family, friend, or business colleague))
 12. (TV or radio advertisement)
 13. (Social media or other online advertisement)
 14. (Other **[SPECIFY: _____]**)
 98. (Don't know)
 99. (Refused)

[ASK NONPARTICIPANTS C2]

- C2. Prior to this call today, were you aware that **[(UTILITY)]** offers technical expertise and cash incentives to help their commercial and industrial customers like you, improve your business' electric energy efficiency?
1. (Yes)
 2. (No) **[SKIP TO C5]**
 98. (Don't know) **[SKIP TO C5]**
 99. (Refused) **[SKIP TO C5]**

[ASK IF C2=1]

- C3. How did your organization learn about the Wattsmart Business Program? **[DO NOT READ LIST; MULTIPLE RESPONSES POSSIBLE]**
1. (Contact with Wattsmart Business representative or utility representative)
 2. (Wattsmart Business printed program materials)
 3. (**[UTILITY]** Website)
 4. (Wattsmart Business sponsored workshop or event)
 5. (**[UTILITY]** mailing or bill insert,)
 6. (**[UTILITY email]**)
 7. (I contacted my contractor/vendor to ask)
 8. (My contractor/vendor let me know about them)
 9. (Previously participated in program/received an incentive)
 10. (Through a trade association or professional organization) **[SPECIFY: _____]**)
 11. (Word of mouth (family, friend, or business colleague)
 12. (TV or radio advertisement)
 13. (Social media or other online advertisement)
 14. (Other **[SPECIFY: _____]**)
 98. (Don't know)
 99. (Refused)

[ASK IF C1=1-10 OR 98 OR 99, OR IF C3=1-11 OR 98 OR 99]

- C4. How likely is it that your business will request an incentive from the Wattsmart Business program for an energy efficiency project in the next 6 months? Would you say ... **[READ LIST]**
1. Very likely
 2. Somewhat likely
 3. Not too likely
 4. Not at all likely
 98. (Don't know)
 99. (Refused)

- C5. What's the best way for **[UTILITY]** to inform you about their incentives for energy-efficient improvements? **[DO NOT READ. MULTIPLE RESPONSES POSSIBLE]**
1. (Contact with Wattsmart Business representative, or utility representative)
 2. (Wattsmart printed program materials or website)
 3. (Wattsmart sponsored workshop or community event)
 4. (Utility mailing, email, newsletter with bill, bill insert,)
 5. (Through my electrician or contractor)
 6. (Through a trade association, trade publication or professional organization) **[SPECIFY: _____]**
 7. (Through the vendor, distributor or supplier where I purchase lighting)
 8. (Newspaper ad)
 9. (Radio ad)
 10. (TV ad)
 11. (Social Media (e.g., Facebook, Instagram, Twitter, YouTube))
 12. (Online ads)
 13. (Other **[SPECIFY: _____]**)
 14. (Not interested in being informed about incentives for energy-efficient improvements)
 98. (Don't know)
 99. (Refused)

D. Motivation and Barriers

[ASK EVERYONE D1]

Thank you. The next few questions are about making energy-efficient improvements for your business.

- D1. What factor is the most important to motivate your company to make energy-efficient upgrades? **[DO NOT READ LIST; RECORD ONE RESPONSE]**
1. (To save money on energy bills)
 2. (To obtain a program incentive)
 3. (To obtain a tax credit)
 4. (To replace old (but still functioning) equipment)
 5. (To replace broken equipment)
 6. (To improve productivity)
 7. (To improve lighting quality)
 8. (Other **[SPECIFY _____]**)
 98. (Don't know)
 99. (Refused)

[NONPARTICIPANTS SKIP TO D7]

[PARTIAL PARTICIPANTS ASK D2-D6]

- D2. Did your company complete the **[MEASURE]** project you initiated with **[UTILITY]** even though you did not receive a Wattsmart Business incentive?
1. (Yes) **[SKIP TO D4]**
 2. (No)
 98. (Don't know) **[SKIP TO D4]**
 99. (Refused) **[SKIP TO D4]**
- D3. Why did you not complete the project?
1. **[RECORD RESPONSE] [SKIP TO E1]**
 98. (Don't know) **[SKIP TO E1]**
 99. (Refused) **[SKIP TO E1]**
- D4. Did your company apply for a Wattsmart Business incentive?
1. (Yes)
 2. (No) **[SKIP TO D6]**
 98. (Don't know) **[SKIP TO E1]**
 99. (Refused) **[SKIP TO E1]**
- D5. Why did your project not receive an incentive?
1. **[RECORD RESPONSE] [SKIP TO E1]**
 98. (Don't know) **[SKIP TO E1]**
 99. (Refused) **[SKIP TO E1]**
- D6. Why did you not apply for an incentive?
1. (Project did not qualify) **[SKIP TO E1]**
 2. (Other) **[RECORD RESPONSE] [SKIP TO E1]**
 98. (Don't know) **[SKIP TO E1]**
 99. (Refused) **[SKIP TO E1]**

[NONPARTICIPANT ASK D7-D14]

- D7. I'm going to read you six short statements describing situations companies experience when considering energy-efficient improvements. Please tell me to what extent you agree with each statement. If it doesn't apply to you, please let me know that. The first statement is: **[RANDOMIZE, READ STATEMENT; THEN JUST FOR THE FIRST STATEMENT, READ THE FOLLOWING: Would you say you strongly agree, somewhat agree, somewhat disagree, or strongly disagree?]**
[READ LIST AND RECORD 1=STRONGLY AGREE, 2=SOMEWHAT AGREE, 3=SOMEWHAT DISAGREE, AND 4=STRONGLY DISAGREE; 97= NOT APPLICABLE, 98=DON'T KNOW, AND 99=REFUSED]
- D2a. Making upgrades at our facility is an inconvenience.
 - D2b. Making energy efficiency upgrades to this facility is too costly.
 - D2c. We don't replace working equipment even if it is not energy efficient.
 - D2d. My company has made all the energy efficiency improvements we can without a substantial investment.
 - D2e. My company leases space, we do not want to invest in energy efficiency upgrades.
 - D2f. Decisions about equipment upgrades are made at a corporate office, and we don't have much input at this facility.
- D8. When calculating the return on investment for proposed capital upgrades, does your company include savings gained from energy efficiency?
- 1. (Yes)
 - 2. (No)
 - 98. (Don't know)
 - 99. (Refused)
- D9. What would motivate your business to make more energy-efficient purchases or upgrades to your current equipment? **[DO NOT READ LIST; RECORD UP TO 3 RESPONSES]**
- 1. (Lower costs of product/equipment)
 - 2. (Information on return on investment/help with the business case for investment)
 - 3. (More information generally)
 - 4. (Higher incentives)
 - 5. (Incentives on different products/technologies)
 - 6. (Other) **[SPECIFY]**
 - 98. (Don't know)
 - 99. (Refused)

[ASK IF D9=3]

- D10. When you say you would like more information, what kind of information is most useful?
- 1. **[RECORD RESPONSE]**
 - 98. (Don't know) **[SKIP TO D13]**
 - 99. (Refused) **[SKIP TO D13]**

[ASK IF D10=1]

- D11. Who could best provide you with this information? For example, a Wattsmart Business representative, someone like your contractor, or a product manufacturer?
1. (Wattsmart Business)
 2. (Contractor/Distributor/Vendor)
 3. (Store staff)
 4. (Product Manufacturer)
 5. (Something else) **[SPECIFY: _____]**
 98. (Don't know)
 99. (Refused)

[ASK IF D9=5]

- D12. When you say incentives on different products or technologies, what kind of products or technologies?
1. **[RECORD RESPONSE]**
 98. (Don't know)
 99. (Refused)
- D13. What are the reasons you have not yet participated in a Wattsmart Business program? **[DO NOT READ LIST; MULTIPLE CHOICES POSSIBLE]**
1. (Don't know enough about program)
 2. (Don't understand what equipment/measures are available)
 3. (Don't have resources for initial investment)
 4. (Don't have enough time to participate)
 5. (Not sure how much savings there will be)
 6. (Don't see any benefits)
 7. (Have participated in past and do not see a need)
 8. (Other) **[SPECIFY]**
 98. (Don't know) **[SKIP TO E1]**
 99. (Refused) **[SKIP TO E1]**
- D14. What could **[UTILITY]** do to help your business participate in the Wattsmart Business program?
1. **[RECORD ANSWER]**
 98. (Don't know)
 99. (Refused)

[ASK EVERYONE]

E. Spillover

- E1. In 2018 or 2019, did you purchase and install any energy efficiency improvements on your own without any financial assistance from a utility?
1. (Yes)
 2. (No) **[SKIP TO SECTION F]**
 98. (Don't know) **[SKIP TO SECTION F]**
 99. (Refused) **[SKIP TO SECTION F]**
- E2. What type of equipment did you purchase and install without assistance?
1. (Lighting) **[SPECIFY TYPE EXAMPLE: LED,]:** _____
 - a. How many did you purchase and install **[SPECIFY]:** _____
 - b. What is the wattage of the installed equipment **[SPECIFY]:** _____
 - c. Where is the equipment installed? (Wall/Ceiling/Outdoors) **[SPECIFY]:** _____
 - d. What type of equipment was removed or replaced **[SPECIFY]:** _____
 2. (HVAC (heating and cooling)) **[SPECIFY EQUIPMENT]:** _____
 - a. How many did you purchase and install **[SPECIFY]:** _____
 - b. What fuel type does this equipment use **[SPECIFY]:** _____
 - c. What is the efficiency rating of the equipment? This will be the HSPF or SEER or EER rating of the equipment. **[SPECIFY]:** _____
 - d. What is the equipment's rated capacity in tons **[SPECIFY]:** _____
 3. (Water heating) **[SPECIFY EQUIPMENT]:** _____
 - a. How may did you purchase and install **[SPECIFY]:** _____
 - b. What fuel type does this equipment use **[SPECIFY]:** _____
 - c. What is the efficiency rating of the equipment **[SPECIFY]:** _____
 - d. What is the capacity of the water heater (if water heater with storage) **[SPECIFY]:** _____
 4. (Variable Frequency Drives (VFDs))
 - a. How may did you purchase and install **[SPECIFY]:** _____
 - b. What type of motor was it installed on **[SPECIFY]:** _____
 - c. What is the horsepower of the motor **[SPECIFY]:** _____

5. (Efficient motors)
 - a. How many did you purchase and install **[SPECIFY]**: _____
 - b. What type of equipment is the motor installed on **[SPECIFY]**: _____
 - c. What is the horsepower of the motor **[SPECIFY]**: _____
6. (Refrigeration) **[SPECIFY EQUIPMENT]**: _____
 - a. How much did you purchase and install **[SPECIFY]**: _____
7. (Building envelope) **[SPECIFY TYPE]**: _____
 - a. How may square feet did you purchase and install **[SPECIFY]**: _____
 - b. What is the efficiency (R-value, thickness) **[SPECIFY]**: _____
 - c. Where was it installed (Wall/Roof/Floor) **[SPECIFY]**: _____
8. (Compressed air) **[SPECIFY TYPE OF PROJECT]**: _____
 - a. How many did you purchase and install **[SPECIFY]**: _____
 - b. What is the horsepower of the compressor motor **[SPECIFY]**: _____
9. (Chillers) **[SPECIFY TYPE OF EQUIPMENT]**: _____
 - a. How many did you purchase and install **[SPECIFY]**: _____
 - b. What size unit did you install **[SPECIFY]**: _____
10. (Pumps) **[SPECIFY WHAT IS IT INSTALLED ON]**: _____
 - a. How many did you purchase and install **[SPECIFY]**: _____
 - b. What is the horsepower of the pump motor **[SPECIFY]**: _____
 - c. What is the efficiency rating of the pump **[SPECIFY]**: _____
11. (Irrigation (gaskets, drains, sprinklers) **[SPECIFY]**: _____
 - a. How many did you purchase and install **[SPECIFY]**: _____
12. (Other) **[SPECIFY]**: _____
 - a. How many did you purchase and install **[SPECIFY]**: _____
98. (Don't know) **[SKIP TO F1]**
99. (Refused) **[SKIP TO F1]**

[ASK IF E2=1-12]

- E3. Just to confirm, did you receive an incentive from **[UTILITY]** or another organization for any of these measures? **[RECORD FOR EACH MEASURE MENTIONED IN E2]**
1. (Yes)
 2. (No) **[SKIP TO E5]**
 98. (Don't know) **[SKIP TO E5]**
 99. (Refused) **[SKIP TO E5]**

E4. [Question Deleted]

[ASK IF E2=1-12]

E5. For these purchases, on a scale from 1 to 5, with 1 being not important at all and 5 being very important, please rate how important were each of the following on your decision to purchase and install [this/these] energy efficient improvement(s). If a factor is not applicable to you, please say so. **[NOTE: RESPONDENTS CAN ALSO STATE THAT A PARTICULAR FACTOR IS NOT APPLICABLE, PLEASE CODE N/A AS 6]**

E5.1 How important was general information about energy efficiency provided by **[UTILITY]** ____ on your decision to purchase these improvements?

[IF NEEDED: ON A SCALE FROM 1 TO 5, WITH 1 BEING NOT IMPORTANT AT ALL AND 5 BEING VERY IMPORTANT. IF A FACTOR IS NOT APPLICABLE TO YOU, PLEASE SAY SO.]

E5.1a **[ASK IF E5.1 = 1-5 AND MORE THAN 1 SELECTED IN E2]** Does your rating for the importance of general energy efficiency information provided by **[UTILITY]** differ for any specific improvements you mentioned?

1. (Yes)
2. (No)
98. (Don't know)

E5.1b **[ASK IF E5.1A=1]** For which of the following improvements would you rate the importance of general energy efficiency information differently, and what would be your rating? **[DISPLAY EQUIPMENT MENTIONED IN E2. MULTIPLE RESPONSE ALLOWED]**

ASK RATING FOR EACH EQUIPMENT SELECTED. [IF NEEDED READ: ON A SCALE FROM 1 TO 5, WITH 1 BEING NOT IMPORTANT AT ALL AND 5 BEING VERY IMPORTANT].

- Lighting
- HVAC (heating and cooling)
- Water heating
- Variable drives
- Efficient motors
- Refrigeration
- Building envelope
- Compressed air
- Chillers
- Pumps
- Irrigation
- [OTHER SPECIFY]**
- None of the above

E5.2 Thank you. Now, how important was product information from **[UTILITY]** program staff or contractors. ____

[IF NEEDED: ON A SCALE FROM 1 TO 5, WITH 1 BEING NOT IMPORTANT AT ALL AND 5 BEING VERY IMPORTANT. IF A FACTOR IS NOT APPLICABLE TO YOU, PLEASE SAY SO.]

E5.2a **[ASK IF E5.2 = 1-5 AND MORE THAN 1 SELECTED IN E2]** Does this rating differ for any of the specific improvements you mentioned?

1. (Yes)
2. (No)
98. (Don't know)

E5.2b **[ASK IF E5.2A = 1]** For which of the following improvements would you rate the importance of information from **[UTILITY]** program staff or contractors differently, and what would be your rating? **[DISPLAY EQUIPMENT MENTIONED IN E2. MULTIPLE RESPONSE ALLOWED]**

ASK RATING FOR EACH EQUIPMENT SELECTED. [IF NEEDED READ: ON A SCALE FROM 1 TO 5, WITH 1 BEING NOT IMPORTANT AT ALL AND 5 BEING VERY IMPORTANT.]

- Lighting
- HVAC (heating and cooling)
- Water heating
- Variable drives
- Efficient motors
- Refrigeration
- Building envelope
- Compressed air
- Chillers
- Pumps
- Irrigation
- [OTHER SPECIFY]**
- None of the above

E5.3 How important was your past experience with a **[UTILITY]** energy efficiency program. ____
[IF NEEDED: ON A SCALE FROM 1 TO 5, WITH 1 BEING NOT IMPORTANT AT ALL AND 5 BEING VERY IMPORTANT. IF A FACTOR IS NOT APPLICABLE TO YOU, PLEASE SAY SO.]

E5.3a **[ASK IF E5.3=1-5 AND MORE THAN 1 SELECTED IN E2]** Does this rating differ for any of the specific improvements you mentioned?

1. (Yes)
2. (No)
98. (Don't know)

E5.3b **[ASK IF E5.3A = 1]** For which of the following improvements would you rate the importance of your past experience with a **[UTILITY]** energy efficiency program differently? **[DISPLAY EQUIPMENT MENTIONED IN E2. MULTIPLE RESPONSE ALLOWED]**

ASK RATING FOR EACH EQUIPMENT SELECTED. [IF NEEDED READ: ON A SCALE FROM 1 TO 5, WITH 1 BEING NOT IMPORTANT AT ALL AND 5 BEING VERY IMPORTANT.]

- Lighting
- HVAC (heating and cooling)
- Water heating
- Variable drives
- Efficient motors
- Refrigeration
- Building envelope
- Compressed air
- Chillers
- Pumps
- Irrigation
- [OTHER SPECIFY]**
- None of the above

[ASK SECTION F TO ALL SURVEY RESPONDENTS]

F. Firmographics

Finally, I have a few general questions about your business.

F1. What industry is your company in? **[DON'T READ RESPONSES UNLESS NECESSARY]**

1. (Accommodation, Lodging)
2. (Arts, Entertainment and Recreation)
3. (Construction)
4. (Dairy, Agricultural)
5. (Educational Services)
6. (Finance, Insurance)
7. (Food Service)
8. (Food Processing)
9. (Health Care)
10. (Manufacturing)
11. (Mining)
12. (Nonprofit and Religious Organizations)
13. (Oil and Gas)
14. (Professional, Scientific and Technical Services)
15. (Public Administration/Government Services)
16. (Retail)
17. (Refrigerated Warehouse)
18. (Real Estate/Property Management)
19. (Repair and Maintenance Service)
20. (Transportation)
21. (Warehouses or Wholesaler)
22. (Other **[SPECIFY: _____]**)
98. (Don't know)
99. (Refused)

F2. **[Question removed]**

- F3. How many people are employed by your company at all locations?
1. (None)
 2. (1-10)
 3. (11-25)
 4. (26-50)
 5. (51-75)
 6. (76-100)
 7. (101-200)
 8. (201-500)
 9. (More than 500)
 10. (Other) [RECORD VERBATIM: _____]
 98. (Don't know)
 99. (Refused)
- F4. What type of fuel is used for space heating at your facility?
1. Electric
 2. Gas
 3. (Other) [RECORD VERBATIM: _____]
 98. (Don't know)
 99. (Refused)
- F5. What type of fuel is used for water heating at your facility?
1. Electric
 2. Gas
 3. (Other) [RECORD VERBATIM: _____]
 98. (Don't know)
 99. (Refused)

G. Closing

[ASK PARTIAL PARTICIPANTS G1-G3] [NONPARTICIPANTS GO TO CLOSING]

- G1. Overall, how satisfied would you say you are with the Wattsmart Business program? Would you say: [READ LIST]
1. Very satisfied
 2. Somewhat satisfied
 3. Not too satisfied
 4. Not satisfied at all
 98. (Don't know)
 99. (Refused)

[IF G1=3 OR 4]

- G2. Why do you say you were **[INSERT ANSWER FROM G1]** with the program?
1. **[RECORD VERBATIM: _____]**
 98. (Don't know)
 99. (Refused)
- G3. Is there anything that **[UTILITY]** could have done to improve your overall experience with the Wattsmart Business Program? **[DO NOT READ THE LIST, RECORD ALL THAT APPLY]**
1. (Better/more communication **[SPECIFY: WHO WOULD YOU LIKE MORE COMMUNICATION FROM? _____]**)
 2. (Quicker response time **[SPECIFY: WHO WOULD YOU LIKE A QUICKER RESPONSE TIME FROM? __]**)
 3. (Larger selection of eligible equipment **[ASK: WHAT ENERGY-EFFICIENT EQUIPMENT SHOULD WATTSMART BUSINESS OFFER INCENTIVES FOR? _____]**)
 4. (Increasing the incentive amount)
 5. (Simplify the application process) **[ASK: IN WHAT WAY? _____]**)
 6. (Simplify the website) **[ASK: IN WHAT WAY? _____]**)
 7. (Provide quicker approval on applications)
 8. (Send incentive check out faster)
 9. (Other **[SPECIFY: _____]**)
 10. (No, nothing)
 98. (Don't know)
 99. (Refused)

This completes the survey! Your responses are very important to [UTILITY]. We appreciate your participation and thank you for your time. Have a good day.

Appendix C. Measure Category Cost-Effectiveness

Completed at the end-use category level, cost-effectiveness was reported for evaluated savings. Table C-1 shows cost-effectiveness inputs for Washington’s Wattsmart program.

Table C-1. Washington Wattsmart Business End-Use Category Cost-Effectiveness Inputs

Input Description	2018	2019	Total
Average Measure Life ^a			
Compressed Air	14.5	15.0	14.7
Energy Management	3.0	3.0	3.0
HVAC	15.5	12.4	13.6
Irrigation	12.1	13.9	13.4
Lighting	13.8	10.5	12.5
Other	13.5	14.9	14.0
Refrigeration	14.8	15.0	14.9
Evaluated Energy Savings (kWh/year) ^b			
Compressed Air	1,282,760	1,092,215	2,374,975
Energy Management	2,537,509	3,267,888	5,805,397
HVAC	388,748	621,052	1,009,800
Irrigation	374,548	985,833	1,360,382
Lighting	16,337,318	10,797,756	27,135,074
Other	1,139,041	579,420	1,718,461
Refrigeration	8,833,564	3,191,362	12,024,926
Total Utility Cost (including incentives) ^c			
Compressed Air	\$273,246	\$239,041	\$534,827
Energy Management	\$287,986	\$458,589	\$549,566
HVAC	\$69,640	\$180,913	\$331,221
Irrigation	\$84,065	\$261,581	\$345,645
Lighting	\$3,156,696	\$2,323,405	\$3,418,277
Other	\$229,168	\$143,881	\$490,749
Refrigeration	\$1,981,591	\$846,268	\$2,243,172
Incentives			
Compressed Air	\$168,519	\$124,266	\$292,785
Energy Management	\$50,784	\$65,402	\$116,186
HVAC	\$33,301	\$106,188	\$139,489
Irrigation	\$52,295	\$153,950	\$206,244
Lighting	\$1,629,515	\$1,024,234	\$2,653,749
Other	\$137,840	\$84,084	\$221,923
Refrigeration	\$1,155,847	\$462,288	\$1,618,135

Input Description	2018	2019	Total
Measure Incremental Costs (excluding incentives) ^c			
Irrigation	\$121,489	\$403,661	\$525,150
Compressed Air	\$339,268	\$213,276	\$552,544
Energy Management	\$60,240	\$85,250	\$145,490
HVAC	\$92,479	\$221,486	\$313,965
Lighting	\$4,212,223	\$2,203,808	\$6,416,030
Other	\$335,562	\$217,221	\$552,783
Refrigeration	\$2,151,831	\$1,001,425	\$3,153,256
Commercial Retail Rate	\$0.0857	\$0.0794	N/A
Industrial Retail Rate	\$0.0698	\$0.0649	N/A
Irrigation Retail Rate	\$0.0920	\$0.0872	N/A

^a Weighted average measure category lives are based on individual measure lifetimes and weighted by savings and the frequency of installations.

^b Evaluated savings reflect impacts at the customer meter.

^c Guidehouse provided program costs, incentives, and measure incremental costs.

Compressed Air

Table C-2, Table C-3, and Table C-4 show the compressed air end-use category cost-effectiveness results for evaluated savings. The compressed air end-use category proved cost-effective from all test perspectives except for the RIM test.

**Table C-2. Washington Compressed Air 2018-2019
(WA_Miscellaneous_Mfg_General Load Shape)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.0340	\$875,689	\$1,292,958	\$417,269	1.48
TRC	\$0.0340	\$875,689	\$1,175,416	\$299,727	1.34
UCT	\$0.0239	\$615,931	\$1,175,416	\$559,485	1.91
RIM		\$2,566,304	\$1,175,416	(\$1,390,888)	0.46
PCT		\$552,544	\$2,243,158	\$1,690,614	4.06
Lifecycle Revenue Impacts (\$/kWh)					\$0.000026013
Discounted Participant Payback (years)					1.48

**Table C-3. Washington Compressed Air 2018
(WA_Miscellaneous_Mfg_General Load Shape)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.035	\$470,143	\$657,984	\$187,841	1.40
TRC	\$0.035	\$470,143	\$598,167	\$128,024	1.27
UCT	\$0.022	\$299,394	\$598,167	\$298,773	2.00
RIM		\$1,310,608	\$598,167	(\$712,441)	0.46
PCT		\$339,268	\$1,179,733	\$840,465	3.48
Lifecycle Revenue Impacts (\$/kWh)					\$0.000014452
Discounted Participant Payback (years)					1.87

**Table C-4. Washington Compressed Air 2019
(WA_Miscellaneous_Mfg_General Load Shape)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.034	\$405,546	\$634,974	\$229,428	1.57
TRC	\$0.034	\$405,546	\$577,249	\$171,703	1.42
UCT	\$0.027	\$316,537	\$577,249	\$260,712	1.82
RIM		\$1,255,696	\$577,249	(\$678,447)	0.46
PCT		\$213,276	\$1,063,425	\$850,149	4.99
Lifecycle Revenue Impacts (\$/kWh)					\$0.000012689
Discounted Participant Payback (years)					1.06

Energy Management

Table C-5, Table C-6, and Table C-7 show the energy management end-use category cost-effectiveness results for evaluated savings. The energy management end-use category proved cost-effective from all test perspectives except for the RIM test.

**Table C-5. Washington Energy Management 2018-2019
(WA_Miscellaneous_Mfg_General Load Shape)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.0181	\$289,527	\$556,503	\$266,976	1.92
TRC	\$0.0181	\$289,527	\$505,912	\$216,385	1.75
UCT	\$0.0163	\$260,223	\$505,912	\$245,689	1.94
RIM		\$1,526,676	\$505,912	(\$1,020,764)	0.33
PCT		\$145,490	\$1,382,639	\$1,237,149	9.50
Lifecycle Revenue Impacts (\$/kWh)					\$0.000251584
Discounted Participant Payback (years)					0.07

**Table C-6. Washington Energy Management 2018
(WA_Miscellaneous_Mfg_General Load Shape)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.014	\$107,091	\$235,546	\$128,455	2.20
TRC	\$0.014	\$107,091	\$214,133	\$107,042	2.00
UCT	\$0.013	\$97,635	\$214,133	\$116,498	2.19
RIM		\$695,763	\$214,133	(\$481,630)	0.31
PCT		\$60,240	\$648,912	\$588,672	10.77
Lifecycle Revenue Impacts (\$/kWh)					\$0.000118706
Discounted Participant Payback (years)					0.04

**Table C-7. Washington Energy Management 2019
(WA_Miscellaneous_Mfg_General Load Shape)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.018	\$182,436	\$320,957	\$138,521	1.76
TRC	\$0.018	\$182,436	\$291,779	\$109,343	1.60
UCT	\$0.016	\$162,588	\$291,779	\$129,191	1.79
RIM		\$830,913	\$291,779	(\$539,134)	0.35
PCT		\$85,250	\$733,727	\$648,477	8.61
Lifecycle Revenue Impacts (\$/kWh)					\$0.000132878
Discounted Participant Payback (years)					0.08

HVAC

Table C-8, Table C-9, and Table C-10 show the HVAC end-use category cost-effectiveness results for evaluated savings. The HVAC end-use category proved cost-effective from all test perspectives except for the RIM test (Table C-8). In 2019, the HVAC end-use category did not prove cost-effective from the PTRC and TRC test perspectives (Table C-10).

**Table C-8. Washington HVAC 2018-2019
(WA_School_HVAC_Aux Load Shape)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.0433	\$450,561	\$526,457	\$75,896	1.17
TRC	\$0.0433	\$450,561	\$478,597	\$28,036	1.06
UCT	\$0.0265	\$276,085	\$478,597	\$202,512	1.73
RIM		\$1,092,523	\$478,597	(\$613,926)	0.44
PCT		\$313,965	\$955,928	\$641,963	3.04
Lifecycle Revenue Impacts (\$/kWh)					\$0.000012453
Discounted Participant Payback (years)					2.28

**Table C-9. Washington HVAC 2018
(WA_School_HVAC_Aux Load Shape)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.032	\$136,160	\$219,607	\$83,447	1.61
TRC	\$0.032	\$136,160	\$199,643	\$63,483	1.47
UCT	\$0.018	\$76,982	\$199,643	\$122,661	2.59
RIM		\$433,483	\$199,643	(\$233,840)	0.46
PCT		\$92,479	\$389,803	\$297,324	4.22
Lifecycle Revenue Impacts (\$/kWh)					\$0.000004057
Discounted Participant Payback (years)					1.93

**Table C-10. Washington HVAC 2019
(WA_School_HVAC_Aux Load Shape)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.052	\$314,401	\$306,849	(\$7,552)	0.98
TRC	\$0.052	\$314,401	\$278,954	(\$35,447)	0.89
UCT	\$0.033	\$199,103	\$278,954	\$79,851	1.40
RIM		\$659,040	\$278,954	(\$380,086)	0.42
PCT		\$221,486	\$566,125	\$344,639	2.56
Lifecycle Revenue Impacts (\$/kWh)					\$0.000009276
Discounted Participant Payback (years)					2.50

Irrigation

Table C-11, Table C-12, and Table C-13 show the agriculture end-use category cost-effectiveness results for evaluated savings. The irrigation end-use category proved cost-effective from the UCT and PCT test perspectives (Table C-11). In 2018, the irrigation end-use category also proved cost-effective from the PTRC test perspective (Table C-12).

**Table C-11. Washington Irrigation 2018-2019
(WA_Irrigation_General Load Shape)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.0542	\$719,922	\$700,104	(\$19,818)	0.97
TRC	\$0.0542	\$719,922	\$636,458	(\$83,464)	0.88
UCT	\$0.0302	\$401,017	\$636,458	\$235,441	1.59
RIM		\$1,645,750	\$636,458	(\$1,009,292)	0.39
PCT		\$525,150	\$1,450,978	\$925,828	2.76
Lifecycle Revenue Impacts (\$/kWh)					\$0.000022366
Discounted Participant Payback (years)					2.72

**Table C-12. Washington Irrigation 2018
(WA_Irrigation_General Load Shape)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.043	\$154,454	\$165,735	\$11,281	1.07
TRC	\$0.043	\$154,454	\$150,668	(\$3,786)	0.98
UCT	\$0.024	\$85,260	\$150,668	\$65,408	1.77
RIM		\$414,579	\$150,668	(\$263,911)	0.36
PCT		\$121,489	\$381,614	\$260,125	3.14
Lifecycle Revenue Impacts (\$/kWh)					\$0.000006441
Discounted Participant Payback (years)					2.04

**Table C-13. Washington Irrigation 2019
(WA_Irrigation_General Load Shape)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.055	\$565,468	\$534,369	(\$31,099)	0.95
TRC	\$0.055	\$565,468	\$485,790	(\$79,678)	0.86
UCT	\$0.031	\$315,757	\$485,790	\$170,033	1.54
RIM		\$1,231,171	\$485,790	(\$745,381)	0.39
PCT		\$403,661	\$1,069,364	\$665,703	2.65
Lifecycle Revenue Impacts (\$/kWh)					\$0.000015120
Discounted Participant Payback (years)					2.99

Lighting

Table C-14, Table C-15, and Table C-16 show the lighting end-use category cost-effectiveness results for evaluated savings. The lighting end-use category proved cost-effective from all test perspectives except for the RIM test.

**Table C-14. Washington Lighting 2018-2019
(WA_Miscellaneous_Lighting Load Shape)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.0369	\$9,203,161	\$11,895,893	\$2,692,732	1.29
TRC	\$0.0369	\$9,203,161	\$10,814,448	\$1,611,287	1.18
UCT	\$0.0218	\$5,440,880	\$10,814,448	\$5,373,568	1.99
RIM		\$27,242,285	\$10,814,448	(\$16,427,837)	0.40
PCT		\$6,416,031	\$24,455,154	\$18,039,123	3.81
Lifecycle Revenue Impacts (\$/kWh)					\$0.000400915
Discounted Participant Payback (years)					1.70

**Table C-15. Washington Lighting 2018
(WA_Miscellaneous_Lighting Load Shape)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.034	\$5,772,398	\$7,843,870	\$2,071,472	1.36
TRC	\$0.034	\$5,772,398	\$7,130,791	\$1,358,393	1.24
UCT	\$0.019	\$3,189,690	\$7,130,791	\$3,941,101	2.24
RIM		\$17,617,720	\$7,130,791	(\$10,486,929)	0.40
PCT		\$4,212,223	\$16,057,545	\$11,845,322	3.81
Lifecycle Revenue Impacts (\$/kWh)					\$0.000212726
Discounted Participant Payback (years)					1.91

**Table C-16. Washington Lighting 2019
(WA_Miscellaneous_Lighting Load Shape)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.037	\$3,430,763	\$4,052,023	\$621,260	1.18
TRC	\$0.037	\$3,430,763	\$3,683,657	\$252,894	1.07
UCT	\$0.024	\$2,251,190	\$3,683,657	\$1,432,467	1.64
RIM		\$9,624,565	\$3,683,657	(\$5,940,908)	0.38
PCT		\$2,203,808	\$8,397,609	\$6,193,801	3.81
Lifecycle Revenue Impacts (\$/kWh)					\$0.000161288
Discounted Participant Payback (years)					1.38

Other

Table C-17, Table C-18, and Table C-19 show the other end-use category cost-effectiveness results for evaluated savings. The other end-use category proved cost-effective from all test perspectives except for the RIM test (Table C-17). In 2019, the other end-use category did not prove cost-effective from the TRC test perspective (Table C-19).

**Table C-17. Washington Other 2018-2019
(WA_Miscellaneous_Mfg_General, WA_School_Space_Cool, WA_Irrigation_General, and
WA_Miscellaneous_Mfg_General Load Shapes)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.0432	\$764,548	\$888,038	\$123,490	1.16
TRC	\$0.0432	\$764,548	\$807,307	\$42,759	1.06
UCT	\$0.0245	\$433,687	\$807,307	\$373,620	1.86
RIM		\$1,850,317	\$807,307	(\$1,043,010)	0.44
PCT		\$552,783	\$1,638,554	\$1,085,771	2.96
Lifecycle Revenue Impacts (\$/kWh)					\$0.000021157
Discounted Participant Payback (years)					2.56

Table C-18. Washington Other 2018
(WA_Miscellaneous_Mfg_General, WA_School_Space_Cool, WA_Irrigation_General, and
WA_Miscellaneous_Mfg_General Load Shapes)

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.038	\$444,942	\$549,913	\$104,971	1.24
TRC	\$0.038	\$444,942	\$499,921	\$54,979	1.12
UCT	\$0.021	\$247,219	\$499,921	\$252,702	2.02
RIM		\$1,165,969	\$499,921	(\$666,048)	0.43
PCT		\$335,562	\$1,056,590	\$721,028	3.15
Lifecycle Revenue Impacts (\$/kWh)					\$0.000013511
Discounted Participant Payback (years)					2.28

Table C-19. Washington Other 2019
(WA_Miscellaneous_Mfg_General, WA_School_Space_Cool,
and WA_Miscellaneous_Mfg_General Load Shapes)

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.051	\$319,606	\$338,125	\$18,519	1.06
TRC	\$0.051	\$319,606	\$307,386	(\$12,220)	0.96
UCT	\$0.030	\$186,468	\$307,386	\$120,918	1.65
RIM		\$684,348	\$307,386	(\$376,962)	0.45
PCT		\$217,221	\$581,964	\$364,743	2.68
Lifecycle Revenue Impacts (\$/kWh)					\$0.000007050
Discounted Participant Payback (years)					3.10

Refrigeration

Table C-20, Table C-21, and Table C-22 show the refrigeration end-use category cost-effectiveness results for evaluated savings. The refrigeration end-use category proved cost-effective from all test perspectives except for the RIM test .

Table C-20. Washington Refrigeration Small 2018-2019
(WA_Grocery_Refrigeration Load Shape)

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.0356	\$4,643,368	\$6,526,029	\$1,882,661	1.41
TRC	\$0.0356	\$4,643,368	\$5,932,754	\$1,289,386	1.28
UCT	\$0.0239	\$3,108,247	\$5,932,754	\$2,824,507	1.91
RIM		\$14,288,634	\$5,932,754	(\$8,355,880)	0.42
PCT		\$3,153,256	\$12,798,522	\$9,645,266	4.06
Lifecycle Revenue Impacts (\$/kWh)					\$0.000156275
Discounted Participant Payback (years)					1.54

**Table C-21. Washington Refrigeration Small 2018
(WA_Grocery_Refrigeration Load Shape)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.032	\$3,082,196	\$4,677,462	\$1,595,266	1.52
TRC	\$0.032	\$3,082,196	\$4,252,238	\$1,170,042	1.38
UCT	\$0.022	\$2,086,212	\$4,252,238	\$2,166,026	2.04
RIM		\$10,396,543	\$4,252,238	(\$6,144,305)	0.41
PCT		\$2,151,831	\$9,466,178	\$7,314,347	4.40
Lifecycle Revenue Impacts (\$/kWh)					\$0.000114913
Discounted Participant Payback (years)					1.34

**Table C-22. Washington Refrigeration Small 2019
(WA_Grocery_Refrigeration Load Shape)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
PTRC (TRC + 10% Conservation Adder)	\$0.045	\$1,561,172	\$1,848,568	\$287,396	1.18
TRC	\$0.045	\$1,561,172	\$1,680,516	\$119,344	1.08
UCT	\$0.029	\$1,022,035	\$1,680,516	\$658,481	1.64
RIM		\$3,892,091	\$1,680,516	(\$2,211,575)	0.43
PCT		\$1,001,425	\$3,332,344	\$2,330,919	3.33
Lifecycle Revenue Impacts (\$/kWh)					\$0.000041362
Discounted Participant Payback (years)					2.14